INDIA: ENVIRONMENTAL MANAGEMENT CAPACITY BUILDING TECHNICAL ASSISTANCE PROJECT

Volume 1: Technical Proposal

Project Proposal

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Introduction

Project objectives[1]

The goal of the proposed project is to assist the GOI to implement its environmental priorities as outlined in the Environment Action Plan (EAP) of December 1993. The specific objective of the project is to enhance environmental management capacity to ensure effective implementation of EAP priorities. This objective would be achieved by:

- strengthening environmental planning, policy formulation and implementation;
- strengthening environmental monitoring and compliance enforcement at center, state and local government levels; and
- supporting community and non-governmental organization environmental mitigation initiatives.

Project description

The project includes four components. The summary description of each component is presented below.

- *Strengthening Policy Planning, Formulation and Implementation.* This component would include six sub-components. The project would support (i) the MOEF's Environmental Research Program (ERP) including a review of program priorities and procedures, and training in research management; (ii) upgrading and expanding MoEF's Environmental Information Service (ENVIS); (iii) establishing an Environmental Economics Unit in the MoEF and developing and implementing a programme of environmental economics in several major universities and policy research institutes; (iv) developing and implementing a program of training in environmental law as well as undertaking a comprehensive review of current environmental legislation; (v) the acceleration of the Central Pollution Control Board's (CPCB) review and updating of existing environmental standards: and (vi) developing environmental indicators and indices to provide policy makers with appropriate tools to make rational environmental and economic decisions.
- *Strengthening Environmental Monitoring and Compliance Enforcement.* This component includes five sub-components. The project would support programmes to (i) review the functions, staffing, workload and location of the regional offices of the MoEF to ensure the effective monitoring and enforcement of clearance

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[1] Material in this chapter has been extracted from the Final Executive Project Summary of 'India: Proposed Environmental Management Capacity Building, TAP'.

conditions for MoEF-approved Environmental Management Plans (EMPs) of development projects; (ii) train and undertake demonstration projects to ensure that mining sector projects comply with environmental regulations; (iii) expand CPCB's zonal atlas/industrial siting, ambient air quality monitoring, and pollution monitoring of small-scale industry programs; (iv) train municipal officials and staff in selected states in environmental subjects to meet requirements of the Constitution (74th Amendment)
Act; and (v) assist the state of Gujarat to develop and implement the Integrated Coastal and Marine Area Management Plans (ICMAMPs).

- *Community and Non-Governmental Organization Initiatives*. This component would have three sub-components. The project would provide support for: (i) a review and expansion of the National Environmental Awareness Campaign (NEAC); (ii) the expansion of the Paryavaran Vahini (Environmental Brigade) community-based environmental monitoring program; and (iii) the establishment of a NGO Environmental Action Fund to assist a consortia of NGOs to undertake larger scale mitigation programs.
- *Gujarat*. This component is designed to bring together all of the elements of an effective environmental management system in one state. Gujarat is the fastest industrializing state in India. Investments estimated around Rs. 730 billion are expected in the next five years. About Rs. 430 billion would be highly polluting bulk drugs, chemicals and dyestuff industries and port development. Managing the tradeoffs between rapid industrial development and protection of the environment is a key issue in the state. In addition to assistance to be provided for the development of an ICMAMP, training of municipal staff, the development of state environmental indicators and indices; and access to the NGO Environmental Action Fund, the project would support a number of additional activities in the state. These are: (i) the strengthening of the Department of Environment and the Gujarat Ecology Commission; (ii) the preparation of a State Environment Action Programme (SEAP); (iii) development of an Environmental Management System (EMS) based on a mixed-policy approach; and (iv) a series of city level studies on the inter-related issues of treatment, recycling, and disposal of industrial and domestic wastewater, groundwater contamination, water supply and health impacts.

Project cost and financing

The total cost of the project including contingencies, taxes and duties is estimated at Rs. 2,499.4 million or US$59.70 million equivalent and would be financed by an IDA credit of SDR-million (US$50.0) which would cover about 85% of costs net of taxes. The GOI would finance the remaining net costs and all taxes and duties.

Project implementation

The MoEF would be responsible for ensuring overall coordination among the various ministries and institutions involved in the implementation of the project. An Empowered Project Steering Committee (EPSC), chaired by the Secretary, MoEF and including the Secretaries of the Ministries of Urban Affairs and Employment (MoUAE), Department of Ocean Development, the Chairman of the Central Pollution Control Board; the Additional Chief Secretary, Gujarat, and a representative from the Department of Economic Affairs, Ministry of Finance would be established. The EPSC would be serviced by a Project Unit in the MoEF. The EPSC would ensure the timely flow of funds, orderly reporting on project implementation, approve consultant contracts; and resolve implementation issues as soon as they arise. Specific sub-components would be managed by the various project agencies, inter-agency, and other core groups.

Status of project development and conditions

The GOI has agreed that all of the identified sub-components are critical to improving environmental management. Several of these are already on-going or are pilot programs which will be brought to scale under the proposed project. A few other sub-components, notably those for environmental economics, environmental law, and mining will require the formation of core groups to plan the details. As conditions of negotiations, the Government would be asked to establish under terms of reference acceptable to the Association: (a) the Empowered Project Steering Committee; (b) a Project Unit in the MOEF; (c) an Environmental Economics Core Group; (d) an Environmental Law Core Group; (e) a Steering Committee on monitoring compliance in the mining sector; and (f) a Steering Committee on urban environment.

Project Benefits

The primary benefit of the proposed project is that it would strengthen the institutional capacity of the Ministry of Environment and Forests, its Regional Offices, other ministries and agencies particularly the Central Pollution Control Board at the center to effectively implement, monitor and enforce the environmental laws, policies, priorities, and programs of the Government at center, state, district and local levels. Project activities which will encourage ministries other than the MOEF to lead in managing specific environmental problems will foster inter-agency cooperation, build more capacity for environmental management, and lead to a more integrated approach to environmental protection and economic development. The project would also complement other environmental institutional development efforts which are on-going under other Bank/IDA assisted projects.

Another benefit of the project is that a concerted effort would be made to improve and expand the role of non-governmental organizations and other grassroots organizations in the environmental management system of India. The project would integrate splintered environmental initiatives such as the National Environmental Awareness Campaign, Paryavaran Vahini, media campaign and others into a focused and thematic program of behavior change that would evolve from "raising awareness" to action. Several project activities will also assist the Government to start the movement away from a pure command-and-control regime to a more "mixed-policy" approach of environmental management. Financial and other incentives will invite industry and other development actors to be partners in the protection and preservation of the environment.

Chapter 1

Environmental Research

1.1 Introduction

The environmental research programme of the Ministry of Environment and Forests aims at developing strategies, technologies and methodologies for better environment management. It also seeks to develop infrastructure and trained manpower for undertaking environmental research. The programme particularly aims at attempting solutions to the practical problems of resource management and provides necessary inputs for development and formulation of action plans for conservation of natural resources and restoration of environmental quality.

Environmental research in the Ministry is being supported under various schemes mentioned below:

- Environment Research Programme.
- Man and the Biosphere programme.
- Action-oriented Research programme for Himalayan region, Western ghats and Eastern ghats.
- Research on wetlands, mangroves and Biosphere Reserves.

Among the above, the Environment Research Programme specifically deals with the 'Brown Agenda', i.e. problems related to pollution, hazardous waste management, agrochemicals, waste minimization and reuse, instrumentation development, natural resource accounting, carrying capacity studies, etc. The other schemes deal with the study of ecosystem functioning, ecological understanding, status survey etc. Overlap of study areas, however, cannot be completely eliminated.

1.2 Objectives of capacity building

The specific objectives of capacity building would be:

- Support a review of research program priorities.
- Support a review of procedures for inviting, reviewing, and funding research proposals.
- Training in research management and methodology.
- Support the Ministry's efforts to disseminate the results of funded projects to decision makers, the scientific community and the public.
- Provision of hardware and software to facilitate interaction with national and international environmental research sources/databases.

1.3 Programme

This sub-component is to be carried out in three phases.

Phase 1

The first phase would consist of MoEF's Research Division staff and selected members of the environmental research scientific community participating in a multi-element, interdisciplinary, international Environmental Research Policy forum. A major outcome of this interaction would be a revised Environmental Research Program, including an implementable action research management plan of policies, practices, and procedures. The national research agenda would largely reflect issues mentioned in the National Environmental Action Plan.

Phase 2

The second phase would consist of local workshops in environmental research methodology and on revised proposal procedures, for members of the scientific research community. Curriculum development and instructional materials design and production, would also be undertaken during this period.

Phase 3

The final phase would include provision of computer hardware and software to MoEF's Research Division to facilitate Internet access to national and international environmental research data sources.

Remarks

- The program should consider training the Ministry officials in design, implementation, and monitoring of All India Coordinated projects (multi-centre projects).
- The divisional work load could be re-distributed among the officers, each in-charge of a national priority theme. The themes could be either media based (air, water, soil) or sector based (industry, power, mining, etc.). The officer in-charge would be responsible for shaping the research agenda for the theme under his/her supervision.

1.4 Key institutions which will be involved in planning, implementation, and coordination

The Environmental Research Division of the Ministry of Environment and Forests will be the key institution. The Division would ensure that the technical assistance program covers the local universities, government and non-government research institutions involved in environmental research. MoEF would also ensure co-ordination with other Ministries (Department of Science and Technology, Council for Scientific and Industrial Research, Ministry of Urban Development, and Department of Ocean Development).

1.5 Additional staff to be appointed

No additional staff is needed

1.6 Equipment to be procured

- Local Area Network.
- Internet Access.
- Cost of hardware acquisition is Rs 5 million (US $0.15 million).

1.7 Number of persons to be trained

In Phase 1

- Ten officers of the Ministry of Environment and Forests will be trained in USA. The officers will study how research priorities are decided by funding agencies and research institutes. They will also study procedures for inviting and reviewing proposals. Finally, they will study ways by which funding agencies utilize the information from funded projects and disseminate the same.
- A research agenda workshop (5 days) would be organized in Delhi by the Ministry with the assistance of the local and expatriate consultants. The participants would be:

Ministry of Environment & Forests	10
Central Pollution Control Board	5
Ministry of Urban Affairs	3
Department of Ocean Development	2
Other government research agencies	10
Private research agencies	10
Universities	10
Total	50

(Assume that 10 participants will have to travel to Delhi)

In Phase 2

Training in project formulation and monitoring, research management and methodology, in India to 200 scientists in 8 batches, for 5 days. This phase can begin only after Phase 1 is complete, and will be spread over 4 years.

The training will focus on:

- describing the new research agenda
- explaining the new proposal preparation and monitoring procedures
- management of inter-disciplinary research institutions
- research methodologies and data treatment
- quality control and assurance in research
- how to publish and disseminate results of research
- patenting and Intellectual Property Rights
- resource allocation
- sources of information (ENVIS and international databases)

1.8 Local consultant institutions

- Tata Energy Research Institute.
- Centre for Environmental Science and Engineering, Indian Institute of Technology, Bombay.
- Dr R T Krishnan, Strategy and Policy Area, Indian Institute of Management, Bangalore.

1.9 Expatriate consultant institutions

- Environmental Forum at Stanford University's Institute of International Studies.
- Western Consortium of Universities (University of California at Berkeley, University of California at Los Angeles, San Diego State University, University of California's Centre for Occupational and Environmental Health).

1.10 Draft terms of reference for the consultants

The local consultants will:

- Assist the Ministry in coordinating with other Ministries and research agencies in identifying the new research agenda for the Ministry. The consultant would prepare a background paper and conduct a workshop on this topic.
- Design the curriculum of the courses in environmental research methodology, project planning and quality control and assurance. The consultants would interact with the Ministry and other likely faculty members. The consultants would provide

bulk of the manpower for conducting these courses, and arrange for other experts to contribute to the courses.

The overseas consultants will:

- Advise the Ministry officials and members of the Environmental Research Committee in formulating an appropriate research agenda.
- Design and implement the overseas training programme (Phase 1), in consultation with the Ministry.

1.11 Indicators of progress

- The new research agenda (in a thematic form) would be published and widely disseminated by the end of the first year.
- The new set of guidelines and format for preparing proposals would be ready by the end of the first year.
- A revised version of the Environment Research Division's Project internal management procedures would be ready by the end of the first year.
- The executive summary of completed projects would be published within six months of the year-ending. This information should also be disseminated through the ENVIS network.
- The number of proposals received would increase by at least 25%.
- The proposal approval rate would be at least 50%. Thus, the number of proposals accepted annually would increase at least by 300%, if the current approval is 20%.
- Increased number of research publications in the field of " Environmental Brown Agenda", in the form of reports, discussion papers, and peer reviewed papers, originating from institutes that were trained.
- Increased use of the above publications by decision makers (specially officers of other divisions of MoEF) and the public.

1.12 Linkages with other sub-components

- A strong link should be maintained between this sub-component and the one on Environmental Information (Chapter 2). Specifically, the Ministry should disseminate information from funded projects through the ENVIS network and train researchers to use the network for their work.
- There is also a link with the sub-component on standards (Chapter 5). The review and modification of standards in the context of environmental health will require India-specific scientific research.

1.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.16
Training	0.37
Materials & books	0.00
Equipment	0.16
Other costs	0.00
Total	0.69

Chapter 2

Environmental information

2.1 Introduction

ENVIS was set up in December 1982 as a plan programme of the erstwhile Department of Environment (now the Ministry of Environment and Forests). Several long term and short term objectives have been laid down for ENVIS. These objectives are to be achieved through the ENVIS network consisting of the Focal Point (FP) as well as the various centres set up by the Ministry.

The objectives of the present set-up are:

Long-term

- To build up a repository and dissemination centre in Environmental Science and Engineering.
- To gear up the modern technologies of acquisition, processing, storage, retrieval and dissemination of information of environmental nature.
- To support and promote research, development and innovation in environmental information technology.

Short-term

- To provide national environmental information service relevant to present needs and capable of development to meet the future needs of the users, originators, processors and disseminators of information.
- To build up storage, retrieval and dissemination capabilities with the ultimate objectives of disseminating information speedily to the users.
- To promote, national and international cooperation and liaison for exchange of environment related information.
- To promote, support and assist education and personnel training programmes designed to enhance environmental information processing and utilization capabilities.
- To promote exchange of information amongst developing countries.

The network has distributed information centres in different institutes/organizations in the country on various subject areas of environment. The Focal Point of the ENVIS network is located in MoEF. ENVIS Centres in different subject areas of environment constitute the nodes of the network. The concept of ENVIS is that of distributed databases in distributed information centres.

The ENVIS Centres are located in a variety of institutions/organizations namely universities, science and technology complexes, ministries and private agencies relevant to some of the areas of environmental studies. It has been a major task to identify and bring them within the fold of a single network. Till now 20 Centres have been set-up and three more Centres have been approved.

The ENVIS Focal Point at MOEF is designated as the Regional Service Centre (RSC) of INFOTERRA Network of UNEP for the South Asia Sub-region. Similarly ENVIS is identified as the host for Sustainable Development Network Programme (SDNP) of UNDP/IDRC and will soon start functioning as the SDNP node in India.

List of existing ENVIS Centres

Sl. No.	Institution	Area
1.	Central Pollution Control Board, Delhi	Control of Pollution (Water and Air)
2.	Industrial Toxicology Research Centre Lucknow	Toxic Chemicals
3.	Environmental Protection Training and Research Institute, Hyderabad	Eastern Ghats
4.	Society for Development Alternatives, New Delhi	Environmentally Sound and Appropriate Technology
5.	Centre for Environment Studies, Madras	Biodegradation of Wastes and Environmental Impact Assessment
6.	Tata Energy Research Institute, New Delhi	Renewable Energy and Environment
7.	Centre for Ecological Sciences, Bangalore	Western Ghats and Biological Diversity

8.	World Wide Fund for Nature - India, New Delhi	Non-Governmental Organizations, Media and Parliament Matters related to Environment
9.	Environmental Planning and Coordination, Bhopal	Environmental Management related to the State of Madhya Pradesh
10.	National Institute of Occupational Health, Ahmedabad	Occupational Health
11.	Central Arid Zone Research Institute, Jodhpur	Desertification
12.	Centre for Environment Education Ahmedabad	Environmental Education
13.	Centre for Advanced Study in Marine Biology, Parangipettai	Mangroves, Estuaries, Lagoons and Coral Reefs
14.	G B Pant Himalayan Environment and Development, Kosi-Katarmal	Himalayan Ecology
15.	Indian School of Mines, Dhanbad	Environmental problems of mining
16.	Botanical Survey of India, Calcutta	Plant Ecology
17.	School of Environmental Sciences, New Delhi	Bio-geochemistry and Environmental Law
18.	National Environmental Engineering Research Institute, Nagpur	Solid Wastes
19.	Zoological Survey of India, Calcutta	Animal Ecology
20.	School of Planning and Architecture, New Delhi	Human Settlements
21.	Bombay Natural History Society, Bombay	Avian Ecology
22.	Forest Research Institute, Dehradun	Forestry
23.	Wildlife Institute of India, Dehradun	Wildlife

2.2 Objectives of capacity building

The objective of capacity building is to establish an on-line and geographically decentralized system of information on environmental issues in India, and to support through training, ENVIS information users, carriers, and providers in government, academia, business and NGOs.

This sub-component will consist of:

- Expansion of the ENVIS system, from 23 ENVIS centers to approximately 30 centres.
- Support to ENVIS centers to upgrade on-line databases, primarily through: on-site technical assistance in database management and clarification of database needs and structure appropriate to their ENVIS role, and support for the digitization of data currently only available in printed media.
- Training to ENVIS users, in the form of short courses offered on a low or no-cost basis to ENVIS information users, carriers, and providers, in government, academia, business, and NGOs.

2.3 Programme

Expansion of the system

The strengthening of ENVIS is to be carried out in a phased manner by identifying areas where databases need to be developed and selecting appropriate existing institutes for setting up ENVIS Centres on such areas.

Presently ENVIS broadly encompasses major environment related issues. In addition, several other subject areas have been identified that need to be strengthened and the existing institutions which have information potential and other infrastructural facilities required for setting up the centres in these areas have also been identified. Seven priority areas are indicated (with* mark) for expansion in the next phase.

Proposed list of new subject areas and the potential institutions for setting up of new ENVIS Centres

	Subject Disciplines	Key Institutions
1.	Atmosphere and Climate*	India Meteorology Department, Delhi
2.	Inland Water (Surface and ground water)*	Central Water Commission, Delhi
3.	Physical, Chemical and Biological Processes	Bose Institute, Calcutta
4.	Disasters including man made	National Geophysical Research Institute, Hyderabad
5.	Food and Agriculture	Indian Agricultural Research Institute, Delhi
		International Crops Research Institute for Semi-arid Tropics, Hyderabad
6.	Population*	Office of Registrar General of India, Delhi
		National Institute of Health and Family Welfare, Delhi
7.	Human Health*	All India Institute of Hygiene and Public Health, Ca cutta
8.	Transport	Automotive Research Association of India, Pune
9.	Environmental Technology*	Indian Institute of Technology, Bombay
10.	Socio-economic aspects	Tata Institute of Social Sciences, Bombay
11.	Statistical Information Pertaining to environment	Central Statistical Organization, Delhi
12.	Standardization	Indian Standards Institution, Delhi
13.	Areas of historic, archaeological and tourist interest	Archaeological Survey of India, Delhi
		Indian Tourism Development Corporation, Delhi
14.	Women Studies*	Centre for Women Studies All India Women's Conference (AIWC)
15.	Environmental Economics*	Madras School of Economics
16.	Trade & Industries	Confederation of Indian Industries
		PHD Chamber of Commerce and Industries

Priority areas for expansion in the next phase.

Upgrading of on-line databases

The information base of ENVIS includes both descriptive as well as numerical data. Descriptive information in the form of publications, reports, reprints, abstracts etc. and numerical data collected from different sources are stored, compiled, processed and analyzed. All ENVIS Centres have been maintaining databases in their respective subject areas. The focus now is to make the information more widely available and more accessible to users and encourage participation of all potential actors in a more coordinated manner. The aspects that need emphasis are mentioned below:

Strengthening the existing databases

- Augmentation of information base/resources, both factual and textual, of each ENVIS centre through acquisition of up-to-date data and information. This includes reports, books journals, and other relevant documents pertaining to the subject area of the respective centre.
- Standardization of record format, covering all relevant aspects and all types of documents. This will be done by providing on-site technical assistance with respect to application of software (CDS/ISIS), format (CCF) etc.
- Acquisition of CD-ROMs available in respective subject areas.
- Digitization of data available only in print
  - data entry for small scale textual data
  - application of scanners and their associated software for building electronic storage of documents.

ENVIS Centres will identify projects related to their respective subject areas, supported by MOEF and other Government agencies and get reports and other related information of those projects including GIS data and maps, and make it available to required users.

Once the database has grown to a critical size, CD-ROMs on specialized subjects by ENVIS Centres would be published for distribution/sale, which will be coordinated by ENVIS Focal Point.

Strengthening of network infrastructure

All ENVIS Centres are now being provided group connectivity through ERNET Programme of the Department of Electronics (DOE). In the first phase 11 centres have been provided with E-mail connection.The DOE has plans of connecting some of the ENVIS Centres located in interior areas where telecommunication lines are not performing satisfactorily, with the utilization of V-SAT facilities.

Since the ENVIS network already exists and the query-response service function is established the objective now is to encourage participation of all potential actors by strengthening the existing network. The following measures are proposed:

- Provide full Internet connection to Focal Point and upgrade hardware and communication infrastructure accordingly.
- Upgrade hardware and communications infrastructure for co-ordination functions.
- Provide E-mail to all centres to enable them to come on-line immediately.
- Subsequently provide leased line connection to Internet through ERNET to all the centres in stages which enables them to host World Wide Web and file transfer protocol sites along with other customized services.
- Create home pages for all the centres and FP.

ENVIS connectivity

Of the 11 centres which have been provided E-mail connectivity through ERNET so far, 7 centres are located in the following institutions which are local to ERNET node have direct E-mail connectivity to ERNET.

Delhi

- Central Pollution Control Board
- Development Alternatives
- Tata Energy Research Institute
- School of Environmental Sciences, Jawaharlal Nehru University
- World Wide Fund for nature
- School of Planning and Architecture

Hyderabad

- Environmental Protection Training Research Institute

The following 3 centres have been provided E-mail connectivity using long distance dial-up link to nearest ERNET nodes.

Ahmedabad

- Centre for Environment Education

Nagpur

- National Environmental Engineering Research Institute (NEERI)

Dhanbad

- Indian School of Mines

The centre at Centre for Ecological Sciences at Bangalore has full Internet connectivity since Indian Institute of Sciences is an ERNET node.

In the next phase the following stages of connectivity are proposed;

- All ENVIS Centres local to ERNET nodes will be provided direct E-mail connection immediately.
- ENVIS Centres not local to ERNET nodes will need to use long distance call to the nearest ERNET node as has been done in the 3 centres mentioned above. E-mail calls would be schedules late night to make use of off-peak rates.
- Subsequently, ENVIS Centres local to ERNET nodes will get full Internet connectivity using local PTT leased lines.
- The remaining centres will be provided full Internet connectivity either by long distance leased lines to nearest ERNET nodes or V-SAT technology.

Information access and retrieval

The ENVIS network will be caters to vast base of information users. The objective now is to extend the benefits of electronic communications to wider base of users. However, it will also ensure a critical bridge between both online and offline users.

The foregoing analysis shows how different types of users access information from the network.

On-line access

Users with full Internet will directly search and down load information available 'public from Focal point/ENVIS Centres connected to full Internet link using file transfer protocol or World Wide Web tools. For information available at E-mail enabled Centres user will send E-mail requests through WWW or directly to Focal Point/ENVIS Centres. In order to get information from Centres which do not have ERNET connection, user will send E-mail through WWW or directly to Focal Point for request for information from off-line Centres.

E-mail access

Users with only connectivity would send query by e-mail to ENVIS Centres/Focal Point for information available ENVIS Centres including off-line Centres. Focal Point passes the e-mail query by postal mail to the concerned off-line ENVIS Centre which responds by postal mail. If a query is received by a centre for information available in other centre, the source need to be identified and route the query accordingly.

Off-line access

The carrier for this category of user group is generally postal mail. The user will send the query to the concerned ENVIS Centres or to Focal Point if user is not sure about the source. The ENVIS Centres then process the query and respond with required information in hard copy or floppy as required by the user and charge as per the policy. If a query is addressed to Focal Point it will be passed on by Focal Point by e-mail or postal mail to the ENVIS Centre for processing. For queries addressed to other ENVIS Centres the source needs to be identified and then route the queries to the concerned centres.

Training

The two broad categories viz., (a)Information providers and (b) information users are considered which have their own subgroups and the needs of them are taken into account to determine the kind of training that is required. Information providers include ENVIS FP and ENVISC and both of them have been assigned various responsibilities.

Responsibilities : Focal point

- Overall coordination of ENVIS network;
- identification of ENVISC in specialized subject areas, their location in selected institutes/organizations and their linkage with the FP;
- framing guidelines and uniform designing procedures for ENVISC;
- collection, storage, retrieval and dissemination of information on areas in which ENVISC have not been established and in some general areas of environment like environmental research, environmental policy and management, environmental legislation, environmental impact assessment, etc.;
- responding to user queries directly or through the ENVISC;
- establishment of a Data Bank containing data on some selected parameters, and computerization in important application areas of environment;
- liaison with relevant International Information Systems and other national information systems;
- information analysis and development of environmental statistics;
- publication of a quarterly abstracting journal 'Paryavaran Abstracts';
- bringing out various other publications on current awareness services, etc.;
- organizing training and seminars;
- monitoring and reviewing of ENVIS; and
- assisting the Scientific Advisory Committee of ENVIS with inputs and rendering other secretarial help

ENVIS centres

- Building up a good collection of books, reports and journals in the particular subject area of environment
- Establishment of linkages with all information sources in the particular subject area of environment
- Establishment of a data bank on some selected parameters relating to the subject area.
- Coordination with the Focal Point for supplying relevant, adequate and timely information to the users
- Helping the Focal Point in gradually building up an inventory of information material available in the Centre
- Identification of information gaps in the specified subject areas and action to fill these gaps
- Bring out newsletters/publications in their subject area for wide dissemination
- Getting feedback from users, data received, response time, action taken as a result of information and impact of action
- Providing timely dissemination of information to both automated and non-automated users.

Proposed workshops and training programmes for information providers

- Two 3-day workshops at regular intervals are proposed covering the roles and responsibilities and operation of other information systems within and outside the country (such as NICNET and INFOTERRA). The National Informatics Centre has addressed most of these issues, which would benefit streamlining some of the ENVIS activities. Similarly application of some of INFOTERRA's corrective measures would immensely benefit the system operation of the ENVIS network.
- Two training programmes of one week duration at regular intervals for the personnel of all ENVIS Centres covering all the above aspects within the country where all the infrastructure needed are available.
- Two overseas training programmes either at UNEP Nairobi, or at the regional centre of UNEP at Bangkok would provide an insight into an international information system on environment.

Training the users

The user category has four subgroups and the information needs of each group are listed:

Government

- Statistical data and also textual information for programme planning, monitoring, decision support etc.

Academic and research institutions

- Factual and textual information for evaluation, design and policy advice functions, besides basic educational activities.

Business and industry

- Information on industrial and related policies.
- Conditions on industrial sites in various locations, technologies, finance and markets.

Non-Governmental Organizations (NGOs)

- Socio-economic, natural resources and policies and procedures and programmes.

Proposed training

Tailor-made one-day training programmes at regular intervals (five programmes) on the following aspects;

- Awareness programme and orientation training.
- Availability of information sources.
- How to access information in a network environment.
- How to use networks
  - set-up
  - query request procedure
  - infrastructure
  - tools used.

Decision support system

ENVIS is a well established electronic and manual network with many repositories of information on various environmental aspects. However, there is a problem with free and timely access to data and information for decision support. The issue would be addressed by:

- Evolving partnerships with NGOs to cater to decision support experimental information.
- Developing models that can convert data into useful decision support information. For this, the concerned ENVIS Centres take up experimental projects and bring out products and services that meet this purpose. An experimental model having many

parameters needed for decision support in the area of renewable energy is being developed at TERI. Information pertaining to various parameters would be made available through the network and updated periodically. Once the service is established it would be extended to other areas.

- Interconnectivity with NIC's NICNET would help in reducing delays and better sharing of resources available.

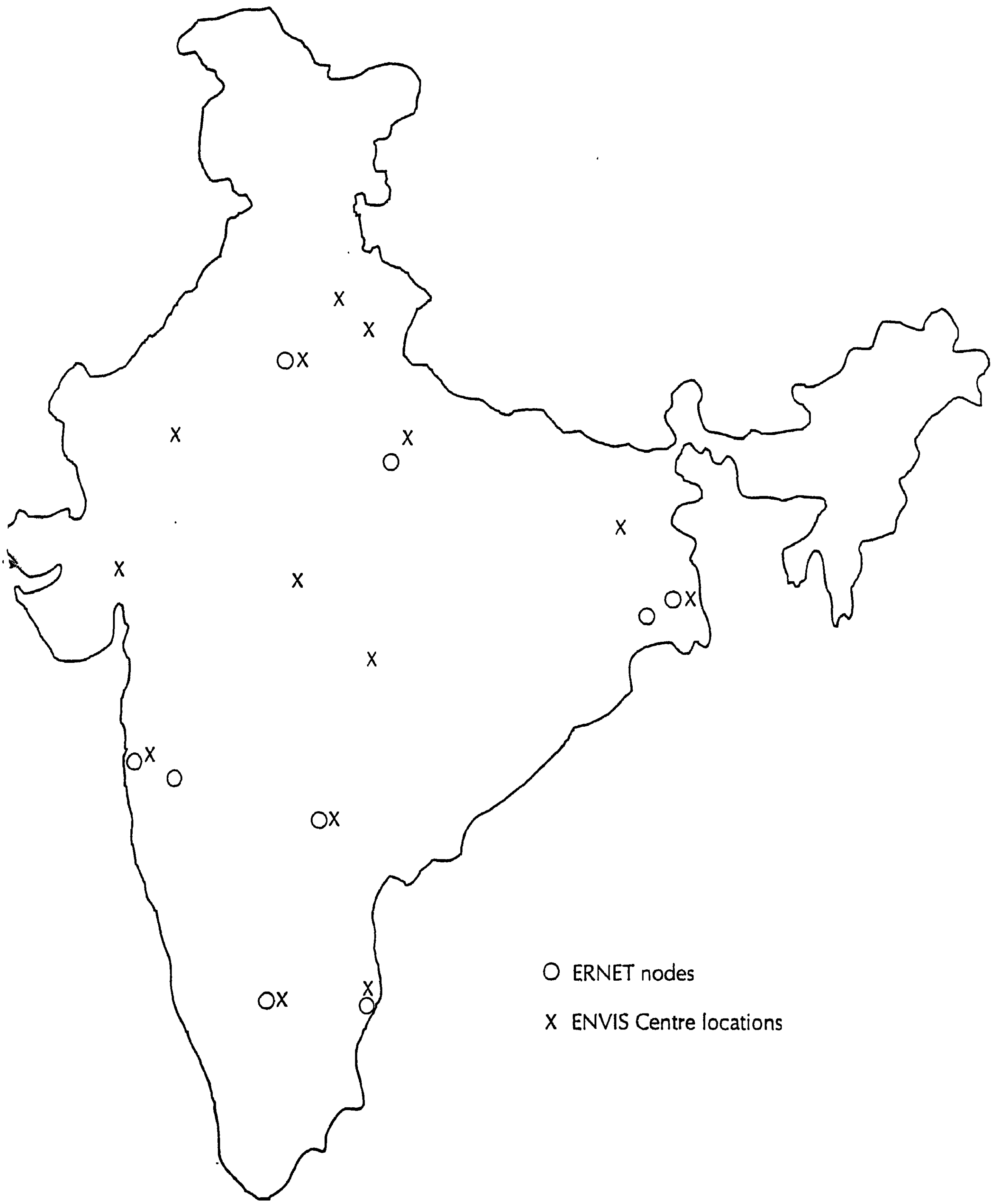


Figure 1. ERNET nodes and ENVIS Centres

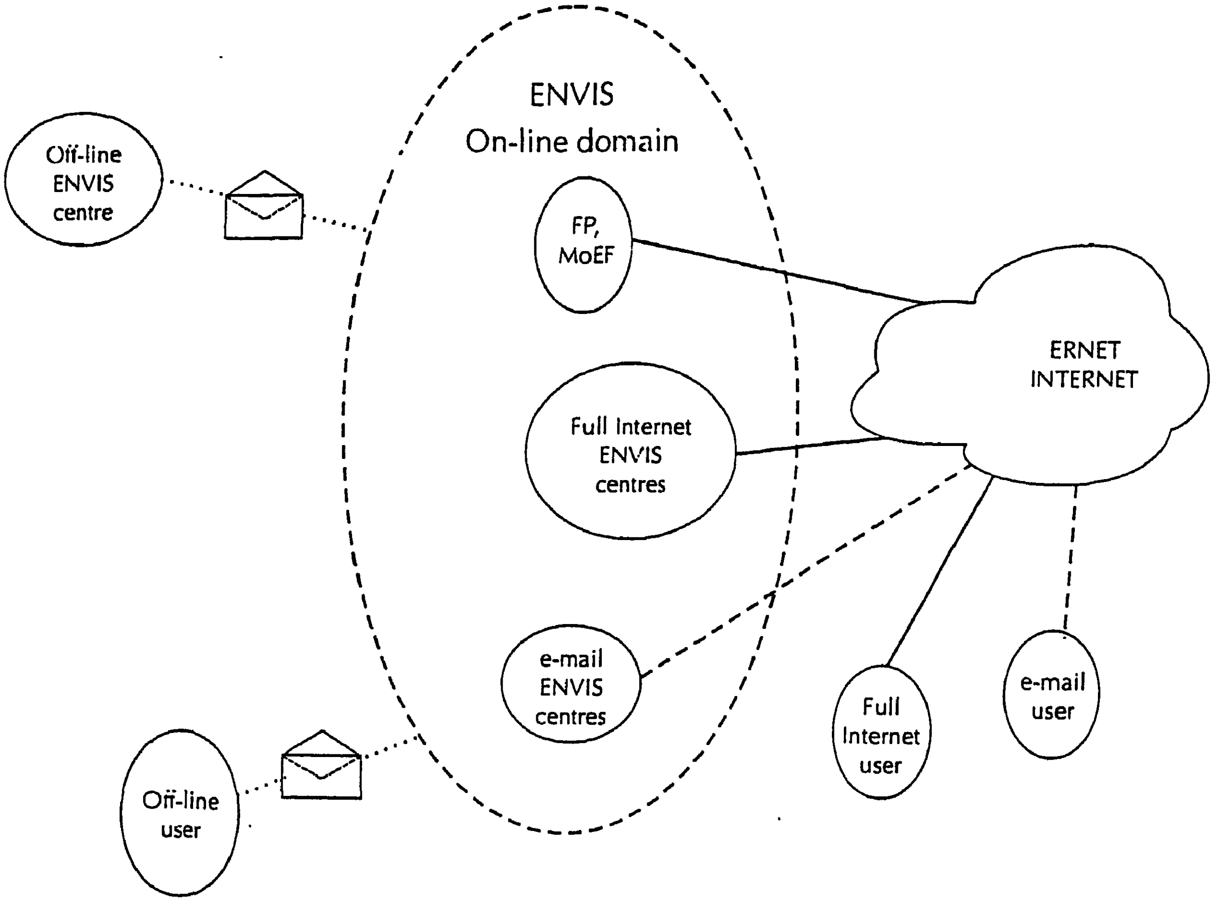


Figure 2. ENVIS connectivity and access

2.4 Key institutions which will be involved in planning, implementation and co-ordination

- ENVIS Focal Point in the Ministry of Environment and Forests.
- ENVIS centres.
- ENVIS Advisory Board.

2.5 Additional staff to be appointed

No additional staff required in the Ministry of Environment and Forests.

2.6 Equipment to be procured

- IT Infrastructure.
- E-mail connectivity.

Each of the 30 ENVIS Centres and the Focal Point will be provided the following equipment costing Rs. 0.69 million: PC, Laser printer, UPS, Modem dial-up, PTT dial-up line, ERNET subscription, Internet connectivity (leased line, 2 modems, PTT leased line (9.6 kbps/annum/km) Router), Internet server (hardware (PC), s/w platforms & tools), and Scanners.

2.7 Number of persons to be trained

Staff	95
Users	120

2.8 Local consultant institutions

It is not foreseen that local consulting agencies will be required.

2.9 Expatriate consultant institutions

It is not foreseen that expatriate consultant agencies will be required.

2.10 Draft terms of reference for the consultants

Not applicable.

2.11 Indicators of progress

At the Focal Point

- Number of nodes established.
- Number of training programmes organized.
- Number of workshops organized.

- Number of projects funded.
- Number of transactions/year/national/international networks.
- Number of E-mail connections.
- Number of all Internet connections.
- Number of staff trained.
- Number of users trained.
- Systems established
- Inventory of information sources
- Referral service

At the ENVIS Centres

- Number of queries answered/annum.
- Number of databases mounted.
- Number of on-line users registered.
- Number of off-line users registered.
- Half-yearly progress report.
- CD created in its respective subject.
- Number of feedback received.
- Publications brought out.
- Number of users trained.

2.12 Linkages with other sub-components

- A two-way interaction is envisaged between ENVIS activities and NGO programmes (Chapter 13). NGOs ought to be trained to use the ENVIS network; at the same time there must be some mechanism by which data gathered at the grass-roots level by NGOs can be fed into the ENVIS databases. The existing ENVIS centre at WWF-India could be the focal point for these activities.
- The data already gathered by the Ambient Air Quality Monitoring network and the data from the proposed expanded programme (Chapter 10) must be available over the ENVIS network, both in the raw form and in a value-added form (statistical summary, trends, forecasting, etc.) The ENVIS centre at CPCB could be the focal point of this particular activity.
- It has been proposed in this chapter that a new ENVIS centre be set up at the Madras School of Economics. It thus follows that all information generated from activities proposed in the chapter on environmental economics (Chapter 3) will be disseminated through this centre. In addition, information related to environmental indicators (Chapter 6) could also be available through this centre.

- A strong link should be maintained between this sub-component and the one on Environmental Research (Chapter 1). Specifically, the Ministry should disseminate information from funded projects through the ENVIS network and train researchers to use the network for their work.

2.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.00
Training	0.47
Materials & books	0.20
Equipment	0.56
Other costs	0.10
Total	1.33

Chapter 3

Environmental economics

3.1 Introduction

Environmental Economics has helped shed light on alternative approaches to environmental management that reduce the financial cost to society of improved environmental management, while securing much higher economic, environmental, and social benefits. The environmental community in India, particularly those concerned with pollution issues, is dominated by environmental engineers. Professionals trained in environmental economics are under-represented, and the economic dimension of policy decisions taken by government environment agencies often neglect viable and cost-effective policy options. As a result, the cost-effectiveness of measures being proposed and implemented is inadequately analyzed, needlessly expensive, and inefficient policies sometimes result.

3.2 Objectives of capacity building

The project will strengthen the environmental economics capacity in India, and enable the application of economic tools to the general debate on environmental management in India across the full range of issues such as priority-setting for environmental policy, the implications of the government budget on the environment, the relationships between trade and the environment, and policy approaches for pollution control, resource management, and biodiversity conservation. Training workshops and courses will enhance the use of environmental economics and analytical skills in the formulation and implementation of development projects, programs, and policies, and strengthen capacity for such activities as natural resource accounting. The project will also identify sectors and specific country sites for demonstration of the use of environmental economics tools and methods.

Specifically,

- Training will be provided to Masters in Economics students and non-Economist professionals on how to use tools of environmental economics in EIAs, project analysis, and policy formulation.
- Case studies will be undertaken to demonstrate the use of Environmental Economics, and the findings of these case studies will be converted into training aids and teaching materials.

3.3 Programme

The environmental economics sub-component will consist of:

- Establishing an Economics, Indicators, and Project Planning Cell in the Ministry of Environment and Forests.
- Support to develop an environmental economics curriculum, teaching materials, case studies developing the case studies into teaching materials.
- A faculty-upgrading programme, designed to train economics faculty members from across India in basic environmental economics, in order to better equip them to introduce the above curriculum in their respective colleges and universities. This will consist primarily of short (1 month) courses offered in India, but will be supplemented by a few (three per year) post-doctoral fellowships for 6 months at prominent environmental economics faculties in other countries.
- A programme to invite environmental economics faculty from other countries to spend 6 months teaching and conducting research on an India-specific topic.
- Training programmes for non-economists, on applications of environmental economics, especially in such topics as pollution control policy, environmental costs and benefits, environmental assessments, and environmental-growth tradeoffs. These programmes would consist primarily of short (one week) courses, offered to MoEF, state-level Environment Departments, Pollution Control Board officials, members of the Indian Economic Service, non-environment government agencies such as Departments of Industry, Coal, Power, Petroleum, Fertilizer, Fisheries, Bureau of Industrial Costs and Pricing, Town and Country Planning Organization and Directorates, etc., industry and banking representatives, NGOs, the media, and other interested outside parties.
- Support to university and institute libraries to expand their collections in environmental economics in the form of: (i) a one-time stocking of important books and journals, and (ii) support for future acquisitions on a declining scale over the life of the project.
- Support to applied research, case studies, and best practices in the area of environmental economics. The general themes of the research programme will be developed in consultation with the MoEF, the core institutes, and others. Against these themes, proposals could be invited. A tentative list of themes would include: (i) lessons from experience, especially case studies on how other countries have addressed environmental issues; (ii) the costs and benefits of investing in the environment; (iii) approaches to regulation enforcement; (iv) approaches to decentralization; (v) public participation and public disclosure; and (vi) fiscal and financing issues.

A team of consultants will be responsible for implementing certain key components of the programme. This team will consist of:

- A 'lead' consultant (local).
- An 'advisory' external consultant.
- Three local consultants.

Activities	Function
Methodology workshop	All parties get together and discuss the plan of action.(Environmental Economics cell, team of consultants, faculty, researchers)
Library stock taking	Ascertaining the status of libraries
Training materials workshop	Team of consultants discusses and puts together the training materials for Faculty training workshops.
Faculty training workshops	Environmental Economics cell staff and faculty are trained in environmental economics; curriculum is discussed
Curriculum workshop	Curriculum for Environmental Economics for M.A. in Economics students and non-Economics students is finalized.
Environmental Economics for M.A.	Environmental Economics courses over two semesters for M.A. Economics students
Courses for non-economists	Of one week duration to give non-economists exposure to ideas in Environmental Economics
Case study workshops	Case study selection, discussion and dissemination

3.4 Key institutions which will be involved in planning, implementation and coordination

The Environmental Economics, Indicators and Project Planning cell will be set up within the Ministry of Environment and Forests.

The functions of the cell will be:

- To monitor and manage the capacity building exercise in environmental economics (research and training).
- Planning for external assistance in the environment.
- Providing such inputs in policy making as for the use of economic instruments and trade and the environment.

For capacity building activities the Madras School of Economics will be the coordinating institution and will work under the aegis of the Environmental Economics cell at the Ministry of Environment and Forests. The Madras School of Economics will work closely with such a core group of Environmental Economics institutes in India as the Indira Gandhi Institute of Development Research, the Institute of Economic Growth and the National Institute of Public Finance and Policy.

Besides the Madras School of Economics, three universities/institutes (such as the Delhi School of Economics, and the Gokhale Institute of Politics and Economics) which offer Masters in Economics programmes will be identified.

3.5 Additional staff to be appointed

The Environmental Economics, Indicators and Project Planning cell will be set up within the Ministry of Environment and Forests. It should be headed by a person with an advanced degree in economics who has worked on the various dimensions of environmental economics, for instance, on both natural resource conservation and pollution abatement. Apart from the environmental economist, the cell should have a statistician, and perhaps two scientists, who have worked in biology and chemistry.

3.6 Equipment to be procured

Support will be given to university and institute libraries to expand their collections in environmental economics in the form of: (i) a one-time stocking of important books and journals, and (ii) support for future acquisitions on a declining scale over the life of the project.

The different universities and institutes will also be given support to acquire equipment such as computers, and software.

3.7 Number of persons to be trained

- A one year (2 semester) course, is proposed, in Environment Economics on regular Master's programme for students majoring in Economists. This could be recommended by the UGC.
- It is also proposed that programme to train (a) Ministry of Environment and Forests Environmental Economics cell members (b) Economics faculty in basic Environmental Economics be conducted as:
  - month long training courses in India
  - post-doctoral fellowships for 6 months at prominent Environmental Economics faculties in other countries.

- Training programmes for non-economists, on applications of Environmental Economics. 25 participants will be trained in each week long training workshop.
- A programme to invite Environmental Economics faculty from other countries to spend 6 months teaching and conducting research on an India-specific topic.

3.8 Local consultant institutions

A roster of local and expatriate consultants will be developed. Consultants on the roster can then be appointed for carrying out specific functions.

3.9 Expatriate consultant institutions

See above

3.10 Draft terms of reference for the consultants

A. Lead consultant (local)

General

- The lead consultant will work closely with the Environmental Economics cell of the Ministry of Environment and Forests during the entire period of the project to ensure successful implementation. The lead consultant will be responsible for training programmes, quality of the case studies, technical aspects of the teaching materials, and the final report of the project.

Detailed terms of reference

The consultant will be responsible for the following:

- The consultant, jointly with Ministry staff, will conduct a methodology workshop bringing together all the concerned parties in the project.
- Supervise the stock taking and strengthening of environmental economics libraries in different centres with the help of the different local consultants.
- Coordinate all training activities with the other consultants. Identify appropriate environmental economics concepts, methods, and policies to be used by environmental economics training programmes. Prepare the training materials for the training materials workshop, and the work programme for the project.
- With the other consultants, train the faculty who are going to teach environmental economics in faculty training workshops.
- Visit the universities/institutes while environmental economics courses are being held to get feedback and help faculty improve.

- Work closely with and coordinate the activities of the advisory consultant, and the three local consultants to provide the necessary technical assistance and guidance for directing sector and site-specific case studies.
- Along with the local consultants help convert the sector and site-specific case study findings into teaching materials and training aids.
- Prepare an inception report, an interim report at the end of one and a half years, and a final report at the end of three years.

B. Advisory consultant (expatriate)

General

- The advisory consultant will work closely with the lead consultant and will provide critical technical inputs into the conduct of the training programmes, and case studies.

Detailed terms of reference

The advisory consultant will be responsible for the following:

- Provide suggestions for the stocking of the libraries at the different centres.
- Working with the other consultants, help identify appropriate environmental economics concepts, methods, and policies to be used by environmental economics training programmes. Help prepare the training materials for the training materials workshop.
- With the other consultants, train the faculty who are going to teach environmental economics in faculty training workshops.
- Provide technical assistance and guidance for directing sector and site-specific case studies.

C. Consultants (local)

General

- The consultants, whose activities will be coordinated by the lead consultant, will help conduct the training programmes, and the case studies.

Detailed terms of reference

The consultants will be responsible for the following:

- Help the lead consultant conduct a methodology workshop bringing together all the concerned parties in the project.

- Help the lead consultant supervise the stock taking and strengthening of environmental economics libraries in different centres.
- Help the lead consultant prepare the training materials for the training materials workshop, and the work programme for the project.
- Train the faculty who are going to teach environmental economics in faculty training workshops.
- Visit the universities/institutes while environmental economics courses are being held to get feedback and help faculty improve.
- Provide the necessary technical assistance and guidance for directing sector and site-specific case studies.
- Help convert the sector and site-specific case study findings into teaching materials and training aids.

3.11 Indicators of progress

An independent committee should review the programme.

Quantitative indicators

- The number of libraries set up/strengthened with good Environmental Economics collections
- The number of Economics faculty trained to teach environmental economics
- The number of Master's in Economics students and non-Economists trained in Environmental Economics
- The number of case studies completed

Qualitative indicators

- The relevance of training
- The choice of course material
- Selection of trainers with the right knowledge and experience
- Selection of trainees with the right background
- Gaps in knowledge filled by the case studies
- Analysis of policy alternatives by the case studies

Long run impact indicators

- Has the policy framework been strengthened, i.e. has there been a progressive reduction in environmentally damaging subsidies?

3.12 Linkages with other sub-components

- It has been proposed in Chapter 2 that a new ENVIS centre be set up at the Madras School of Economics. It thus follows that all information generated from activities proposed in the current chapter will be disseminated through this centre. In addition, information related to environmental indicators (Chapter 6) could also be available through this centre.
- A strong link should be maintained between activities proposed in this chapter and those proposed under the chapter on Environmental Indicators (Chapter 6). Specifically, the development of indices related to environmental elasticity needs inputs from economists as well as physical scientists.

3.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.30
Training	1.20
Materials & books	0.50
Equipment	0.28
Other costs	1.00
Total	3.28

Chapter 4

Environmental Law

4.1 Introduction

The Constitution of India provides for the protection and safeguard of the environment through the Directive Principles (Part IV) and the Fundamental Duties (Article 51, Part A). There are several other laws under the Union List, State List and the Concurrent Lists that make specific provisions for protection of the environment. The other relevant legislation are the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment Protection Act (EPA), 1986, the Indian Penal Code, 1860, the Public Liability Insurance Act, 1991, and the Criminal Procedure Code, 1973, etc. In spite of the existence of these acts and legislation, there is little to be said of their effective use.

There are three issues and problems concerning environmental law: India has passed comprehensive environmental protection legislation over the past ten years; the passage of environmental legislation is directly correlated to a large increase in litigation against government and private development interests; and law school curriculum, bar examinations and case law databases have not kept pace with the large volume of litigation. Therefore, newly graduating lawyers as well as practicing attorneys, are not adequately prepared to represent their clients in environmental litigation.

The environmental law component will support a review of existing law school curricula, and identify gaps related to environmental protection legislation and case law. Based on the identified gaps, new courses and modules for existing courses will be designated to update and be consistent with recent environmental legislation and court rulings.

4.2 Objectives of capacity building

The overall objective is to impart jurisprudence institutions and individuals within the country, with respect to environmental and other relevant laws.

The specific objectives are:

- To review existing environmental and other laws in the country periodically.
- To build in-house (teachers and lawyers) capabilities in the area of environmental law.
- To build the capacities of public officials, future lawyers, etc.
- To develop facilities (library, computers, etc.) in the country to facilitate effective networking and capacity-building.

4.3 Programme

The capacity-building programme envisaged for environmental law would be undertaken in two phases - (I) in-house (NLSIU) capacity building and infrastructure development, and (II) capacity-building for other key institutions.

Phase I: In-house capacity-building and infrastructure development

- The NLSIU would identify lawyers, teachers and international consultants in the country who could help in developing the capacities internally.
- A detailed review of the environmental policies and law would be done to bring a baseline for development of the curriculum for the two phases.
- During this period, the major activity of NLSIU along with the local and expatriate consultants would be to identify areas in which capacities have to be built.
- A methodology workshop will be conducted, and working groups formed who would be responsible to develop course curriculum for the different key institutions/individuals listed above.
- The law and environment teachers will be trained, i.e., training of the trainers. They will in-turn be responsible to build the capacities of the key institutions identified.
- Several publications and papers will be brought out during this period that will be useful to the participants of the capacity-building programme.
- Case studies will be prepared and an outline drawn of research projects that could be taken up during the programme by the participants.
- It is proposed that a quarterly newsletter with a wide circulation on e-mail and otherwise will be started on the subject.
- Seminars and workshops would be held internally inviting national and international experts.
- A minimum of two publications will be brought out in the first year.
- A network of different institutions and individuals (local and abroad) in the field would be established, that would work as a "hot-line" service to NLSIU.
- A training institute and guest-house facilities should be set up in the NLSIU to facilitate the capacity-building programme.
- Existing library facilities within the NLSIU should be upgraded by acquiring more relevant books, etc., and also on-line cataloging services with other libraries within the country and abroad.
- Computers and other equipment are also necessary for this training centre.

Phase II: Training

- This phase will include training nodules of three months each for different target institutions.
- The five modules would be for
  - Module I: government officials
  - Module II: lawyers/bar/judges
  - Module III: students (law and environment)
  - Module IV: NGO's
  - Module V: industrialists
- Every module will take about 25 participants who will write a term paper each.
- There will be an evaluation workshop at the end of the year.
- An agenda for the next year will also be prepared.

Time frame for Phase I and work plan

The time frame for the first phase is one year. The work plan for Phase I would include broadly (a) planning of the capacity-building programme (b) preparation of course material and (c) training of trainees. Phase II is primarily the capacity-building programme.

4.4 Key institutions which will be involved in planning, implementation and coordination

It is felt that the knowledge of the potential use of environmental laws in the country would enhance the primary objective of sustainable development. Since laws have a bearing across most aspects of development, and that at almost all levels jurisprudence is necessary to carry the effect of these laws, the following key institutions have been identified.

Government

- Ministry of Environment and Forests (MoEF).
- Regional Ministry of Environment and Forests (RMoEF).
- Central and State Pollution Control Board (CPCB/SPCBs).
- Municipalities and other local bodies.
- Other public officials.

NGOs and others

- Those directly and indirectly involved in environmental issues.
- Legal practitioners (bar, bench, etc.).
- Industrialists.

Academic institutions/individuals

- Research institutes.
- Law and environmental teachers.
- Students of law and environment.

4.5 Additional staff to be appointed

No additional staff is needed.

4.6 Equipment to be procured

Information technology infrastructure.

4.7 Number of persons to be trained

This will be estimated during the Phase I of the programme.

4.8 Local consultant institutions

To impart the capacity-building programme to the above key institutions, it is necessary that local experts and expatriate consultants be identified. The roles of the local and the expatriate consultants are clearly defined below.

The NLSIU, Nagarbhavi, Bangalore has been identified as the main local consultant. The NLSIU will consult and take inputs from other national and international institutions/consultants during the programme. Some of the other local institutions that will be consulted are:

- Centre for Environmental Law, WWF, New Delhi.
- Indian Law Institute, New Delhi.
- School of International Studies, JNU, New Delhi.

The role of the NLSIU would be to develop the course curriculum for the different key institutions, and organize the entire capacity-building programme. The other local and expatriate consultants would advise and give inputs to the NLSIU at various points in the programme. All the course modules would be coordinated by the NLSIU.

4.9 Expatriate consultant institutions

It is essential that expatriate consultants be part of the programme to provide inputs at all stages of the programme. These consultants will coordinate with the NLSIU directly. Some of the consultants identified by the NLSIU are:

- Imperial Technological Institute, London, UK.
- School of Law, University of Warwick, Coventry, UK.
- University of California, Berkeley, USA.

- Legal Defense Fund of Sierra Club, USA.
- School of Oriental & African Studies, London University, UK.

The main role of these consultants would be to impart experiences from their countries through case studies, implications of non-compliance of international environment related agreements, standards and regulations.

4.10 Draft terms of reference for the consultants

Local consultants

The NLSIU would play the coordination role for the entire programme. Their specific responsibilities could include the following:

Phase I

- Coordination and planning of all the activities for the programme. This would include conference and workshop organization, identification of the other local and expatiate consultants, all communication between participants, consultants and the MoEF.
- The NLSIU will conduct the methodology workshop and coordinate the formation of the working groups. The working groups will plan the components of the training for trainees programme.
- The working groups will prepare all course material and coordinate the preparation of material by the expatriate consultants.
- The NLSIU will identify all participants except those of the government which will be the responsibility of the MoEF.
- They will conduct a review of existing environmental and other relevant laws. They will bring out a minimum of two publications on the findings of this activity.

- A long term planning workshop will be held, to decide on the agenda for the next four years. This will be coordinated by the NLSIU with participation of the working group, the MoEF, the local and expatiate consultants.
- They will coordinate the development of the course material for the different key institutions identified.
- The School will be responsible for developing a system and maintaining active networking with the various institutions within and outside the country.
- They will also look at aspects related to library development - acquisition of books, cataloging, linking up with other libraries in and outside the country, etc.

Phase II

- The NLSIU will conduct the modules for the different key institutions, with the inputs of the other local and expatiate consultants.
- They will conduct the evaluation of each of the modules through feedback from the participants and tracer surveys.
- They will serve as guides for the participants during the case studies.
- At the end of each year of the capacity-building programme the NLSIU will conduct an evaluation and planning workshop, to decide on the possible changes that would need to be accounted for in the next years programme.
- All the other local consultants will be responsible for advising the NLSIU on different aspects related to course structure and content. They may be required to develop the course material for a specific module, guide the participants when they undertake the case studies, and provide inputs at the methodology, planning and evaluation workshops.

Expatriate consultants

The main role of these consultants would be to impart experiences from their countries to the participants. Their specific tasks would be:

- Provide planning inputs during the Phase I of the programme.
- They would have to give inputs into specific components of the programme such as overview of the status of environmental law in the different countries; impart experiences through case studies, give updates of new international regulations; and, discuss implications of non-compliance of international environment related agreements, standards and regulations with reference to
- Prepare the course material for their components in consultation with the NLSIU.

4.11 Indicators of progress

It is difficult to determine the indicators of progress (performance) of a capacity-building programme such as environmental law, since the time of effective output from the programme is fairly long term. Also, many of these are intangible and cannot be quantified.

Quantitative indicators could be

- Number of trainees and trained trainers; and
- Number of students trained who go onto practice environmental law. The qualitative indicators could be the following:

Qualitative indicators could be

- A "tracer study will be conducted. This would involve: to take a tentative work plan from the participants to address how they plan to implement, network and disseminate what they learnt. They will be contacted as per the schedule provided by them to evaluate the extent of fulfillment. This is called a 'tracer study'.
- Call the trained to impart experiences and possibly train in the next year's programme.
- Evaluation of case studies/term papers.
- Module and programme evaluation of each of the consultants and faculty.
- Activity-wise (planning, course material, training, etc.) qualitative evaluation through workshops, review and frequency of updates of the course material, etc.
- Some of the target/key institutions such as the industrialists and active NGOs, would use the knowledge of environmental law to either fend off/fight cases. These cases could be an evaluation of the programme.

4.12 Linkages with other sub-components

- Activities undertaken under Environmental Law capacity building need to be linked to activities proposed in Chapter 5 (Environmental Standards), Chapter 7 (Strengthening Regional Offices), Chapter 8 (Mining Sector), and Chapter 13 (Environmental Awareness).

4.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.63
Training	1.73
Materials & books	0.10
Equipment	0.10
Other costs	0.10
Total	2.66

Chapter 5

Environmental Standards

5.1 Introduction

Environmental standards in any country must balance the costs and benefits of firm-level emissions standards, ambient concentration standards, and standards imposed on municipal facilities, such as waste-water treatment plants, off-shore out-takes, or land-fills. All of these pose difficult issues, and implicit economic, environmental, and social trade-offs. Standards are best assessed in light of good data on the average cost of compliance and of local ambient conditions.

In India. standards have been challenged for being too lax. too stringent, or simply, on occasion, irrelevant. Given the enormous capital investment that is affected by firms and municipalities trying to comply with such standards. it is appropriate that standards face periodic review and updating. For example, under the recently approved Bombay Sewage Disposal Project, the environmental assessment process concluded that GOI's bacterial standard for effluent discharge in coastal waters was unnecessarily stringent when compared to standards in the European Union and United States. GOI has agreed that by June 1997, it will establish revised water quality standards. applicable to the discharge of wastewater to marine coastal waters. This suggests that a more general review of the appropriateness of national standards and some of the existing legislation may be necessary to bring them in line with current acceptable standards and practice.

5.2 Objectives

- To improve the economic and environmental efficiency of air. water. and toxic emissions standards being set by GOI.

5.3 Programme

The project will finance expert assistance to the CPCB's on-going review and modification of standards procedures.

5.4 Key institution which will be involved in planning, implementation, and coordination

Central Pollution Control Board

5.5 Additional staff to be appointed

None

5.6 Equipment to be procured

- Computer hardware

5.7 Number of persons to be trained

- 30 persons trained in India for review and development of new standards.
- 5 persons trained overseas.

5.8 Local consultant institutions

Yet to be identified

5.9 Expatriate consultant institutions

Yet to be identified

5.10 Draft terms of reference for the consultants

Yet to be identified

5.11 Indicators of progress

- Improved compliance rates among large, medium and small firms.
- Declining marginal costs of abatement
- Improved availability and use of firm-level pollution data by the CPCB and private sector
- Measureable improvements in ambient pollution levels

5.12 Linkages with other sub-components

- The review and modification of standards in the context of environmental health will require India specific scientific research (Chapter 1).
- Attempts should be made to develop standards relevant to the mining sector (Chapter 8), coastal and marine areas (Chapter 12) and urban areas (Chapter 11).
- Legal considerations while formulating new standards can be facilitated by activities proposed under Chapter 4 on environmental law.

5.13 Budget

Yet to be estimated

Chapter 6

Environmental indicators

6.1 Introduction

Currently MoEF does not use environmental indicators either to provide 'early warning' signals against the deterioration of the environment, or for project monitoring. Developing, implementing, and incorporating the feedback for MoEF to take timely action would require not only a considerable effort of research activity in the formulation and implementation stages, but also a network that connects various cells of the MoEF and its regional offices so as to ensure its 'workability' and its utilization to form inputs for short-term and long-term measures for mitigating the deterioration of the environment.

6.2 Objectives of capacity building

Indices to be developed

The Cost of Remediation Index. This index measures environmental deterioration directly in economic terms. Four major environmental sectors are evaluated: air quality, water quality, land and eco-system.

Environmental Elasticity. This index expresses the variability of environmental quality in relation to economic growth by measuring changes in environmental quality relative to changes in the economy it is possible to assess the sustainability of states, regions in the country and the country as a whole. This concept is particularly useful for monitoring environmental trends, which are essential for policy making at the macro level.

Environmental Diamonds. The diamond shows the relationship among the four principal dimensions of environmental quality: air,water, land, and ecosystem. They are very good for visual comparison among sectors or among countries.

General Description

Environmental Indicators are of various types. Choosing appropriate indicators is a difficult task and there are various factors that are involved in their choice. For various broad categories of environmental problems (forestry, biodiversity, land quality, air pollution, water pollution, global environmental problems, and institutional issues) indicators would need to be developed. In some cases, such as air and water pollution, indicators have been established and used in the developed world. However, in cases such as biodiversity there is much less experience to draw upon.

A typical framework is the Pressure-State-Response (PSR) framework developed by the OECD (described briefly in the World Bank Office Memorandum titled Environmental Performance Indicators, by Dixon et al, November 1995). The framework distinguishes three different aspects of an environmental problem: the pressure that causes the problem; the state of the environment that results from the pressure; and the response to the problem. Pressures affect the state of the environment, which in turn elicits responses to address those issues. Both pressure and state are typically required for evaluation. Indicators can be qualitative as well as quantitative with spatial as well a temporal dimensions. Finally, indicators must be limited in number to be effective as a aid to decision making.

An example set of Environmental Performance Indicators described in the Worl Bank Note cited earlier is reproduced below.

Pressure	State	Comments
Forestry • Rate of deforestation • per capita wood consumption; • incentives for forest clearing	Deforestation • Area of forest Preserving intact forest areas: • Area of roadless forest; • Forest fragmentation index. Watershed protection: • Proportion of watershed with appropriate cover.	The appropriate state indicators depends on the objective; pressure indicators are often similar across objectives, but the appropriate resolution changes (for example, to focus on particular watersheds).
Biodiversity • Encroachment into natural habitats; • Legal and illegal hunting offtakes; • Upstream pollution sources.	• Area of natural habitat; • Habitat fragmentation index; • Proportion of habitat adjoining incompatible land uses; • Population status of selected indicator organisms; • Changes in the biogeochemistry of soils and waterways.	Special attention needs to be devoted to identifying and monitoring the state of critical natural habitats.
Land quality • Nutrient removal in excess of fertilizer applications and natural regeneration: • Erosion rates.	• Nutrient balance (of N, P, K, and of other nutrients depending on the specific crops being grown); • Soil depth; • Organic matter content; • Total Factor Productivity (TFP).	Appropriate indicators are very site-specific.
Water pollution Discharges of human and industrial wastes: • Fecal coliform counts; • Biochemical Oxygen Demand (BOD); • Chemical Oxygen Demand (COD); • Heavy metals concentrations.	Concentration of pollutants in water bodies: • Fecal coliform counts; • Biochemical Oxygen Demand (BOD); • Chemical Oxygen Demand (COD); • Heavy metals concentrations.	The same indicators can serve as measures of pressure on state, depending on where they are measured.

Air pollution Emissions of • Particulates (TSP or PM_{10}) • SO_2; • Lead.	Ambient concentrations of • Particulates (TSP or PM_{10}) • SO_2; • Lead	The same indicators can serve as measures of pressure or state, depending on where they are measured.
Global environmental problems Climate change: • Emissions of greenhouse gases: • CO_2; • CH_4. Stratospheric ozone: • Emissions of ozone-depleting substances (CFC, Halons); • Implementation of ozone-depleting substances phase-out		Measuring the impact of specific projects on a global problem is unrealistic.
Institutional capacity	• Existence of environmental laws and agencies; • Active NGOs; • Number of trained staff in environmental agencies; • Number of laboratory facilities.	

6.3 Programme

Environmental indicators (local)

Development stage. The study group would work very closely with the local consultant organization with technical support and overall guidance from the expatriate consultant. The broad steps would be the following:

- Identifying the critical areas for which indicators would need to be developed.
- Reviewing current information status on environmental parameters, their method of measurement, time and frequency of measurement, etc.
- Developing an appropriate and implementable set of indices. Identifying additional parameters that would need to be measured (modifying existing modalities of measurement) for each of the areas, their mode of measurement. etc.

Implementation stage. This would require networking at two levels. The first would be at the field level - the field team for each of the areas would report/be linked with the appropriate regional offices, which in turn would be linked with the centre.

Environmental indicators (global)

Environmental indicators will be formulated for designing and monitoring externally funded projects under the Global Environment Facility or any other joint implementation schemes under the climate change convention.

6.4 Key institutions which will be involved in planning, implementation and coordination

The key institution would be the MoEF. The team from MoEF would be the same as the Environmental Economics Group.

6.5 Additional staff to be appointed

No additional staff is needed.

6.6 Equipment to be procured

Computers along with remote sensing equipment and accessories.

6.7 Number of persons to be trained

Approximately 30 people would be trained every year. The training programme, over a period of three weeks, would familiarize participants in environmental quantification, formulation and implementation of indices. The aim would be to build capacity in this area so that it becomes institutionalised and becomes a part of maintstream environmental management.

6.8 Local consultant institutions

- TERI, New Delhi
- Center for Ecological Sciences, Indian Institute of Science, Bangalore
- World Wide Fund-India, New Delhi
- Madras Institute of Development Studies, Madras

6.9 Expatriate consultant institutions

The suggested expatriate consultant organizations are Massachussets Institute of Technology, and Harvard University.

6.10 Draft terms of reference for the consultants

- (a) Local Environment: Identify environmentally sensitive areas in the country for which indicators will be developed.
  (b) Global Environment: List the projects under GEF/climate change activities for which indicators will be developed.
- For each sensitive area/projects identified in item 1, based on existing literature and actual surveys develop linkages between human activities, and wherever applicable with the 'response agents'.
- Formulate realistic and implementable pressure and state variables for the sensitive areas and the global environment related projects.

- Help MoEF in interpretation and implementation of indicators so as to maximise their efficiency in environmental protection/management.

Note: The above TORs are applicable to both local and expatriate consultants. The local consultant will be the lead agency while the expatriate agency will be the over-all advisor and provide guidance to the lead agency in implementing the above TORs.

6.11 Indicators of progress

Slow down in the deterioration rate of the environmentally sensitive areas.

6.12 Linkages with other sub-components

- Information and data regarding indicators developed as a part of this sub-component will be disseminated through the proposed ENVIS Centre at Madras School of Economics (Chapter 2).
- A strong link would be maintained between activities proposed in this chapter and those proposed under the chapter on Environmental Economics (Chapter 3). Specifically, the development of indices related to environmental elasticity needs inputs from economists as well as physical scientists.
- The development of region specific indicators would help the Regional Offices (Chapter 7) in monitoring the environmental projects in their jurisdiction.
- The Ministry of Environment and Forests would need to interact with the Ministry of Urban Affairs, Department of Ocean Development, Central Pollution Control Board, and Centre for Mining Environment, to develop appropriate indices for urban environment, coastal and marine pollution, air quality, and mining impacts, respectively.

6.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.26
Training	0.41
Materials & books	0.00
Equipment	0.10
Other costs	0.44
Total	1.21

Chapter 7

Regional offices of the Ministry of Environment and Forests

7.1 Introduction

All projects after clearance from the MoEF at the centre need to be monitored at the regional offices. The frequency and time of monitoring is decided by the centre. Currently the regional office is very understaffed, for e.g., the Regional MoEF (RMoEF) at Bangalore has just 4 persons in the environment wing with two research assistants, each of them handling over 150-160 cases per year. They also have (almost) no legal or financial powers. Therefore presently there is very little meaningful follow-up.

7.2 Objectives of capacity building

The objectives are the following:

- Review the functions, staffing, work-load and location of regional offices.
- Open new or relocate existing offices to meet changing regional developments.
- Ensure that project Environmental Management Plans approved by MoEF under the Environmental Impact Assessment Notification are monitored and implemented.

7.3 Programme

Review of existing status of all RMoEFs

This would be a detailed review of the functions, staffing, workload, and location of the Regional offices. It would also cover the systems and procedures employed by the Regional offices as called for under existing regulations, and its interaction with the State Pollution Boards. The outcome from this review will be an action plan to expand the number of regional offices and upgrade their staffing to better respond to regional differences in industrial development.

Training

This would include an assessment of training needs, curriculum and training materials development, and the training of staff.

7.4 Key institutions which will be involved in planning, implementation and coordination

Regional offices of MoEF and MoEF (Centre).

7.5 Additional staff to be procured

This would be determined after the review. There probably would be with new offices being opened.

7.6 Equipment to be procured

Computers, GIS packages, and Internet connections for all the regional offices.

7.7 Number of persons to be trained

(a) Training programme in environmental management

Time period : 3 weeks
Broad areas of coverage would include

quantification of environmental impacts, environmental impact assessment and management including integration of physical measures, fiscal measures and institutional aspects for successful implementation of management plans

Local consultant : Administrative Staff College of India, Hyderabad

(b) Training programme in enforcement aspects.

Time period : 1 week
No. of persons : 30

Area of coverage will include law and enforcement aspects. Practical ways in ensuring compliance will be discussed.

Local consultant : National Law School of India University

7.8 Local consultant institutions

Administrative Staff College of India, Hyderabad.

7.9 Expatriate consultant institutions

US EPA

7.10 Draft terms of reference for the consultants

- Training programme in Environmental Management
  - Consultant will review current status of working knowledge at RMoEFs on environmental management and design a programme for 3 weeks training in the subject.
  - Areas to be covered are
    - (i) Quantification of environmental impacts
    - (ii) EIA and EMP
    - (iii) Framework for integrated environmental management which would integrate
      - (a) Physical measures
      - (b) Fiscal measures
      - (c) Institutional aspects
    - (iv) Discuss real life environmental management problems faced by participants.

- Training programme in enforcement of Environmental Management Plans.
  - Consultant will update participants on environmental law with a view to strengthen the basis for enforcement. The emphasis will be on practical aspects that hinder compliance again, the basis being to facilitate enforcement.

7.11 Indicators of progress

- Compliance of existing Environmental Management Plans.
- Greater interaction between industry and RMoEFs.
- Companies undertaking environmental management as part of the mainstream activity.

7.12 Linkages with other sub-components

- It is envisaged that activities under Chapter 4 (Law), Chapter 6 (Indicators), Chapter 8 (Mining sector), and Chapter 9 (Industry siting) would enhance the ability of regional offices to monitor and enforce environmental strategies.

7.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.00
Training	0.59
Materials & books	0.44
Equipment	0.48
Other costs	0.00
Total	1.51

Chapter 8

Mining sector

8.1 Introduction

8.1.1 Power to grant a prospecting license or mining lease

The Mines and Minerals (Regulation and Development) Act, 1957, was amended by the Central Government in January 1994 to provide, among other things, greater powers to the State Government in granting a prospecting license or mining lease. As per the Amendment prospecting license or mining lease in respect of minerals specified in the First Schedule can be granted by the State Government only after approval by the Central Government. The minerals specified in the First Schedule include coal and lignite, atomic minerals and 11 metallic and non-metallic minerals (Annexure 1). In respect of all other minerals including minor minerals, the State Government has the power to grant a prospecting license or mining lease. Minor minerals include building stones, gravel, ordinary clay, ordinary sand, and any other mineral notified by the Central Government. Therefore, all applications for prospecting license or mining lease in respect of any land in which the minerals vest in the Government shall be made to the State Government for approval.

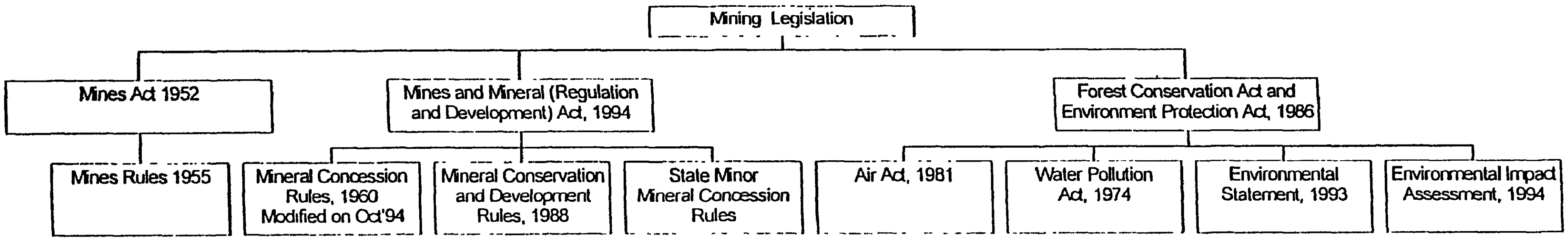
8.1.2 Environment and site clearance for mining projects

Mining projects excluding minor minerals (one of the 29 sectors listed in the Schedule 1 of the Environmental Impact Assessment notification 1994) with lease area more than 5 ha require environmental and site clearance from the Ministry of Environment and Forest (MoEF), Government of India. All other mining projects involving lease areas less than 5 ha of land are required to approach the concerned state government Department of Mining and Geology/ Department of Environment for obtaining necessary clearances. The Ministry of Environment and Forests (MoEF) has constituted an Expert Committee for mining which appraises mining projects for the environmental and site clearance. During 1994-95, 46 projects were received for environmental appraisal and 320 projects for site clearance.

8.1.3 Mining legislation

The mining operations are covered under various legislations. Figure 3 gives the different legislations which control mining operations.

Figure 3. Mining Legislative framework


Mining Legislation
Mines Act 1952
Mines and Mineral (Regulation and Development) Act, 1994
Forest Conservation Act and Environment Protection Act, 1986
Mines Rules 1955
Mineral Concession Rules, 1960 Modified on Oct'94
Mineral Conservation and Development Rules, 1988
State Minor Mineral Concession Rules
Air Act, 1981
Water Pollution Act, 1974
Environmental Statement, 1993
Environmental Impact Assessment, 1994

Note:

Mines Act and Rules	-	For health and safety of workers in mines
Mines and Mineral (Regulation & Development) Act and various Rules	-	For obtaining prospecting licence and mining lease
	-	Scientific mining and conservation of environment (excluding coal, atomic and minor minerals)
	-	For minor minerals
Environmental Protection Act, 1986	-	For Air, Water & Forest conservation.

8.1.4 Role of MoEF

As mentioned earlier, MoEF gives environmental and site clearance for mining projects with lease area greater than 5 ha, but excluding minor minerals. In the MoEF the following divisions deal with matters related to mining.

- Impact assessment division through the expert committee for mining.
- Regional offices of MoEF monitor the compliance of EIA/EMP reports.
- Forest division is responsible for clearing forest areas in mining projects.
- Environmental Education Information Division monitors the activities of the Center for Mining Environment at Dhanbad.

8.1.5 Role of Central Pollution Control Board

The Central Pollution Control Board (CPCB) advises the Central Government on all matters related to the prevention and control of water and air pollution and the improvement of the quality of air. It also coordinates the activities of the State Pollution Control Boards and provides technical assistance and guidance to them. So far as mining projects are concerned CPCB is involved in setting industry standard for air and water quality for mining projects.

8.1.6 Role of State Pollution Control Board

In mining projects consent for air and water quality is given by the State Pollution Control Board (SPCB) for each mine. The SPCB are responsible for implementing the various legislations relating to air and water quality in mining areas.

8.1.7 Center for Mining Environment, Dhanbad

Recognizing the adverse environmental impacts and the need for developing remedial measures that are specific for the mining sector, the MoEF established a Center for Mining Environment at Dhanbad (Bihar) in 1987. The main objective of this Center is to generate scientific data and build national capacity for sustainable mining in the country. The Center conducts post graduate and doctoral level courses, as well as training programs for in-service professionals. Research areas include land use management, noise and vibration problems in mining areas, air pollution in fire areas and others. A brief note giving a description of the Centre's activity given in Annexure 2.

8.1.8 *Issues*

- Multiple agencies like the state departments of environment, mining and geology, state pollution control boards, regional offices of MoEF and Directorate General of Mines and Safety (DGMS) are responsible for enforcing the compliance under the various Acts and Rules. Some of the state pollution control boards do not monitor the mining projects at all and have even exempted these projects from applying the 'consent to operate'. Even those state pollution control boards who issue 'consent to operate' and collect 'water cess fee', monitor the compliance of air and water pollution standards only and do not enforce other appropriate mitigation measures for environmental protection.
- Inadequate capacity within the state pollution control boards and regional offices is a common issue across the country. Lack of expertise in environmental planning and monitoring of mining projects, inadequate number of professional staff members (in some regional offices each member is assigned a large territory with several hundred industrial units including mining) are most common. Staff members are normally trained to deal only with industrial air and water pollution control and as a result, major environmental concerns of mining projects such as land degradation, hydrology, etc. do not receive adequate attention.
- Laxity in addressing the impacts from the minor minerals mining projects is another common issue in most of the states. Each state has its own Minor Minerals Regulations. The operators of these mines do not require any environmental clearance. Moreover, no guidelines have been prepared for this sector. Also, most state pollution control boards have exempted these mining projects from applying for a 'consent to operate' and do not monitor or enforce any environmental standards.
- At present there is not much networking among the various institutions responsible for regulating mining and related environmental impacts. As a result, there is a little coordination and exchange of information/experiences among the mining institutions and different Government agencies responsible for issuing clearances.

8.2 Objectives of capacity building

The main objective of this sub-component is to strengthen the national capacity for environmental planning and monitoring in the mining sector. More specifically, this sub-project aims to enhance the capabilities of the concerned central (CPCB, Regional Offices of MoEF & IBM) and state agencies (Departments of Environment, Mining and Geology Departments, and State Pollution Control Boards) in developing and monitoring the compliance of local policies, EMPs, and appropriate environmental standards, for all mining projects. The existing mining institutions such as Center for Mining Environment; Dhanbad;

will be strengthened in planning and design of environmentally benign mining projects, who would become resource groups for MoEF, state departments of environment, CPCB and state pollution control boards.

8.3 Programme

The following four major activities are envisaged:

- Review of existing policies/standards and their enforcement mechanisms.
- Institution strengthening.
- Demonstration projects.
- Training.

All four activities are inter-related and will have to be carefully phased and coordinated to achieve the objective. For example, the review will help to identify institutional needs, the demonstration projects will provide specialized training opportunities and generate information that will strengthen the institution.

Activity 1. Review of policies/standards and their enforcement mechanism

Review of policies/standards and their enforcement mechanisms is expected to produce four main outcomes:

- An inventory analysis of existing environmental and mine leasing policies, with respect to environmental and social concerns, and roles and responsibilities of various agencies at central, state and local level in implementing these policies.
- Identification of institutional and technical barriers in enforcing the existing policies and in promoting environmentally benign designs and mitigation practices.
- Generation of policy options and standards for all mining projects including minor minerals.
- Unambiguous definition of roles and responsibilities of multiple agencies, which will be complementary to each other. This review will also provide feedback to the other sub-project - strengthening of Regional Offices of MoEF, in the context of monitoring the compliance of EMPs for mining projects. While the local consultants would carry out the review, foreign consultant would bring in international experiences in formulating policies and standards.

Activity 2. Institution strengthening

Institution strengthening activity is expected to cover two sets of institutions. One set consists of government agencies - Indian Bureau of Mines, MoEF and its regional offices, CPCB and its zonal offices, state pollution control boards and state Departments of Mining & Geology and Environment, who are responsible for policy making, standards setting and their enforcement. These agencies will be strengthened (a) to enhance their capacity in the above areas, (b) to establish an effective data management system and (c) to establish a network among these agencies to assist the sharing of information for improved decision making. The other set of institutions consists of centers of excellence and research institutions working in the field of mining. These institutions will be strengthened in (a) developing their expertise in planning, design, and implementation of environmentally benign mine designs; (b) becoming a resource group for the government agencies described above in discharging their responsibilities and for the mining companies in implementation of environmentally benign designs; and (c) carrying out specific research studies to equip the Indian mining sector with the latest developments. (d) Training officials from concerned government agencies, mining industry and Non-Government Organisations.

Essential infrastructure development including purchases of equipment and instruments for field research and surveys required for achieving these outputs, will be provided. In order to bring in international experiences and state of art technological developments in mining, twining arrangements with reputed mining institutions in developed countries such as Australia, U K and Canada, where mining is a major economic activity will be provided. A list of some activities for possible twining arrangements are as follows. This list can be expanded depending on the needs of the Institution concerned.

- Setting up standards, for air, water, noise, land use, etc. in mining projects. The twining arrangement can be between CPCB/SPCB and United States Environmental Protection Agency (USEPA), Environment Protection Agency-Australia (EPA).
- Land reclamation/rehabilitation
  twining arrangement can be between Forest Research Institute/CME/IBM/ concerned mining companies with Environment Protection Agency-Australia (EPA), United States Bureau of Surface Mines (USBSM), National Coal Board - UK, etc.
- Environmentally benign mining plans
  twining arrangement can be between CME/IBM with USBM, NCB - UK and others.

Activity 3. Demonstration projects

Differences in climate, topography, soils, flora, fauna, land use, mining techniques and commodities being extracted lead to differences in the possible impacts of exploration and mining and the environmental management and rehabilitation techniques required to minimize and repair these impacts. The mines in the public sector and organized private sector are medium to large in size and the organizations are aware of their environmental management needs. Small mines specially minor minerals are largely unaware of the serious impacts on land use, flora, fauna and water courses. Therefore it is necessary to carry out demonstration projects to achieve good environmental performance, minimize conflicts with other land users and restore or enhance the land use capability of the areas affected by their activities. The projects cover planning, monitoring, management systems and technical issues.

Best practice demonstration projects for specific mitigation measures such as land reclamation, closure of old abandoned mines, regeneration of regional ecology, etc. offer many advantages. One is to develop feasible mitigation measures and techniques for both the major and minor mineral mining projects. Another is to train mine operators in instilling the principles of planning, design, implementation and monitoring the mitigation measures. Also, these projects generate information that can be used for policy and decision making. A list of possible demonstration projects is given below.

- Mine planning and environment protection.
- Rehabilitation and revegetation of mined areas.
- Community consultation and involvement.
- Post mining and land use management.
- Tailings containment.

Activity 4. *Training*

Training of officials from government agency and industry would be an essential input for realizing the objective of this sub-project. Depending on the target groups and their specific needs, specialized training programmes will be organized within and outside India. The broad areas would be planning, design, and implementation of environmentally benign designs, development and enforcement of policies, standards, EMPs, awareness programmes and training of trainers.

The key Institutions which will provide training are CME (ISM) and IBM. Each Institute will provide 10 programmes every year for 5 years. The duration of the programme will be ranging from 3 to 10 days and the participants would be about 20 per programme. The selection of topics for the various programmes, designing the structure and training of the faculty in these centres would be carried by the local and foreign consultants provided under the Institution strengthening.

8.4 Project implementation

MoEF will be the overall coordinator and would be responsible for the project implementation. It is suggested that a Steering Committee can be constituted to monitor and guide the programme under the chairmanship of Secretary, MoEF. The officer in-charge of Mining Cell in the Ministry would be the member-secretary. The members of the Steering Committee would be representative from CPCB, SPCB, regional office of MoEF, Ministry of Coal, Ministry of Mines. Department of Mining and Geology in the state government, CME, IBM and NGOs.

8.5 Additional staff to be appointed

None

8.6 Equipment to be procured

Provisions for major equipments, computer, GIS package, etc. have been made in the budget. The regional offices of MoEF will be provided with a computer, GIS and accessories. The CME and IBM will be provided with fully equipped laboratories for monitoring and analysis of various parameters. A list of equipments/instruments required in these two centres is given in Annexure 3

8.7 Number of persons to be trained

1200

8.8 Local consultant institutions

- Center of Mining Environment (CME) at the Indian School of Mines, Dhanbad.
- Indian Bureau of Mines (IBM), Nagpur.
- Central Mining Research Institute (CMRI), Dhanbad.
- National Environmental Engineering Research Institute (NEERI), Nagpur.
- Forest Research Institute (FRI), Dehradun.
- Tata Energy Research Institute (TERI), New Delhi.
- Department of Mining, Banaras Hindu University (BHU), Varanasi.
- Kothagudam School of Mines, Andhra Pradesh.
- Regional Engineering College, Senatkal, Karnataka.

8.9 Expatriate consultant institutions

For the environmental R&D in mining the key institutions would like to have tie-ups with the following organizations abroad in the form of exchange visits of faculty and scientists and also for conducting the investigations.

- Environment Protection Agency
  40 Blackall St
  Barton Act 2600
  Australia

- Mining and Environment Research Network
  School of Management
  University of Bath
  Bath BA2 7AY
  United Kingdom
- United States Environmental Protection Agency
  401, M. Street S.W. (A-106)
  Washington, D.C. 20460
  U.S.A.
- Department of Mining Engineering
  Southern Illinois University at Carbondale
  Carbondale, Illinois 62901-6603
  U.S.A.
- Institute fur Markscheidewesen
  Technical University Clausthal
  Clausthal Zellerfeld
  Germany
- Department of Civil and Mining Engineering
  University of Wollongong
  Northfields Avenue
  Wollongong NSW 2522
  U.S.A.

8.10 Draft terms of reference for the consultants

Activity 1. Review of policies/standards and their enforcement mechanism

Background

Indian mining industry operates two types of mines, namely: large and medium size mines in the organised sector and exploiting metallic and non-metallic minerals, atomic minerals and fuel minerals and large number of small mines exploiting minor minerals. The mines are spread through out the country. A large number of mines in both categories are operating in forest areas. No specific standards have been laid down for mining projects. At present the standards laid down under different Acts and Rules are applicable to mining projects. CPCB has developed industry specific standards for a number of polluting industries. Developing standards for mines is also in CPCB's agenda of activities.

Objective

A review of the existing policy/standards applicable to the mining industry and to prepare a comprehensive document (covering various legislations applicable to the industry) that will assist in implementing the programme of bringing an improvement in the environment of mining areas.

Scope

- An inventory analysis of existing environmental and mine leasing policies and roles and responsibilities of various agencies at central, state and local level in implementing these policies.
- Identification of institutional and technical barriers in enforcing the existing policies and in promoting environmentally benign designs and mitigation practices.
- Generation of policy options and standards for all mining projects including minor minerals.
- Unambiguous definition of roles and responsibilities of multiple agencies, which will be complementary to each other.

Output

A comprehensive document on policies/standards/enforcement mechanism for the mining sector which will assist in achieving satisfactory levels of performance in environment protection in the mining area.

Time schedule

This activity can be completed in 12 months. Local consultant institutions to be involved are TERI, CMRI. Foreign institution to be involved is USEPA or EPA-Australia.

Activity 2. Institution strengthening

Background

Since there are many agencies involved in the environmental planning and monitoring of the mining sector, there is a need to strengthen the capacity of officials working in these agencies. In addition the MoEF has set up a Centre for Mining Environment at Dhanbad to impart training to in-service personnel in the industry on environmental management in mining areas. The faculty in this centre also needs to enhance their skills.

Objectives

To enhance the capacity of the officials involved in environmental planning, monitoring, enforcement, implementation, education/training to achieve improved environmental performance in mining areas.

There are two categories of institutions to be strengthened:

- Government agencies like MoEF, CPCB and their regional/zonal offices, IBM, SPCB's, Department of Mining and Geology/Environment in the state government.
- CME, FRI.

Scope

Category I institutions

- To enhance the capacity of officials in Government agencies like MoEF, CPCB, IBM, SPCB, etc. through twining arrangements with local and foreign institutes.
- To establish an effective data management system.
- To establish a network among these agencies to assist the sharing of information for improved decision making.

Category II institutions

- Developing their expertise in planning, design, and implementation of environmentally benign mine designs through twining arrangements with local and foreign institutes.
- To function as a resource group for the government agencies described above in discharging their responsibilities and for the mining companies in implementation of environmentally benign designs.
- Carry out specific research studies to equip the Indian mining sector with the latest developments.
- Conduct training programmes.

Some areas of research studies is listed below.

- Investigation into the ground water balance in selected mining areas.
- Development of air quality dispersion models for mining areas.
- Utilisation of solid waste, ash, etc. as a mine-fill in underground and opencast mines.
- Development of noise indices for mining projects.
- Characterisation of dust in mining projects.

Output

- Trained staff/faculty.
- Adequate instrument/equipment support.
- Environmentally benign mining plans
- Results of R&D studies.

Time schedule

The duration of this activity will be spread over five years. Local consultant institutions will be CMRI, TERI, NEERI, and foreign consultant institutions will be USEPA, EPA-Australia, National Coal Board - UK.

Activity 3. Demonstration projects

Background

It is a well established practice in some developed countries like USA, UK, Australia to have partnership arrangement between the government environmental protection agencies and the mining industry to explore ways of achieving improved level of performance in environmental protection. One way of achieving this is to conduct demonstration projects which result in enhanced environmental performance.

Objectives

To demonstrate examples of best practice environmental management and to share this experience and expertise with the environmental planners and policy makers.

Scope

- To select five demonstration projects in the areas listed in Activity 3 and carry out these projects jointly with mining companies.

Output

- Development of best practice and feasible mitigation measures.
- Data generated can be used for policy and decision making and can be disseminated
- Experience gained can be promoted among mining companies.

Time schedule

Three to five years. Local consultant institutions would be CMRI. TERI and others. Foreign consultant institutions can be USEPA, USBSM, EPA (Australia), Germany, etc.

Activity 4. Training

Background

Training of officials in the government agencies and mining companies is an essential input for realising the objectives of capacity building.

Objective

To impart training to officials in environmental science and technology with particular reference to environmental management in the mining areas.

Scope

To conduct 10 programmes every year for officials in various levels of the different organisations. The training would cover the following topics.

- Setting standards for various parameters.
- Legislation and enforcement mechanisms.
- Environmental management in mining areas.
- Air and water pollution and its control.
- Subsidence prediction, control and management.
- Land use management.
- Land reclamation.
- Waste water treatment.
- Soil conservation.
- Noise and vibration.
- Management of spoils and tailings.

Output

Trained manpower to achieve enhanced environmental performance in mining areas.

Time frame

The training programme will range from 3 to 10 days. About 10 programmes will be conducted every year and this activity will continue for five years.

8.10 Indicators of progress

Success of environmental policy initiatives is contingent on a well functioning network of institutions that can support the formulation, implementation and regulation of environmental objectives. The major performance indicators can be grouped in 4 broad areas.

- Legal framework.
- Institution framework.
- Staff development.
- Technical capability.

Institution development is one of the most important and challenging areas and the indicators for the institution capacity building can be identified as follows:

- Number of officials trained from various agencies and mining industry.
- Existence of environmental laws & standards and agencies for enforcement.
- Presence of active NGOs in mining areas.
- Well equipped laboratory and monitoring facilities in institutions.

8.12 Linkages with other sub-components

- A link is envisaged between activities proposed under this chapter and those under Chapter 5 (Environmental standards), Chapter 4 (Law), Chapter 6 (Indicators), and Chapter 7 (Regional Offices).

8.13 Budget

The proposed expenditure for the above 4 major activities for a period of 5 years has been worked out based on some assumptions. The summarised budget is given below:

Categories of expenditure	Amount (US $ million)
Consultant services	1.03
Training	2.85
Demonstration projects	0.50
Equipment	0.60
Total	4.98

Chapter 9

Industry siting

9.1 Introduction

Environmental planning is a relatively new but increasingly more important task for the environmental administration in India. Considering population density, population pressure and the fast pace of industrial development, this is of particular importance with respect to the spatial (geographical) dimension of environmental phenomena. Therefore, pilot projects were consequently initialized by CPCB in 1988 and by the Indo-German project during its second phase lasting from 1988-93. The environmental planning program was launched on a larger scale in 1994-95 by CPCB by allocating substantial funds. An Environmental Planning Cell with own staffing and considerable budgetary allotments was established at CPCB and is now under operation.

Work done during 1995-96

In 1995, the CPCB initiated a project for preparation of district-wise Zoning Atlas for siting of industries based on environmental considerations with technical support from the German Technical Co-operation (GTZ). The Zoning Atlas is to serve multiple users including the industry and regulatory authorities. For the first phase of the program, 19 districts covering 14 States were selected based on willingness shown by the State Pollution Control Boards. The districts selected either are environmentally sensitive or are facing rapid industrialization.

The work done during 1995-96 is briefly outlined below.

- An Environmental Planning Group was set up at CPCB along with necessary computer hardware and software (GIS) and equipment.
- Guidelines were developed for preparation of Zoning Atlas for siting of industries. Also, an Information Brochure and Operational Manual were developed to assist the State Pollution Control Boards in execution of the project.
- Agreement was finalized with 14 State PCBs for taking up the Zoning Atlas work.
- Teams were established at SPCBs and training was imparted on methodologies and procedures for preparation of Zoning Atlas.
- The diversified data needs of the project have been collected from a number of Departments both Central and State. The help of the District Authorities was taken where needed. Extensive survey was carried out within the Districts and wherever necessary additional monitoring of air/water/land was taken up. All the thematic maps required for the Atlas have been completed manually for 16 districts (12 States) and the computer works are in progress. The base maps and thematic maps which have

been collated and prepared relate to the various aspects of environmental quality including the following.

- Land use
- Physiography
- Agricultural use and land capability
- Protected areas(unsuitable zones for industrial development)
- Surface water related maps showing risks due to location of water polluting industries
- Ground water quality related maps including a map including a map showing risks due to disposal of effluents or solid/ hazardous waste on land
- Air quality related maps including a map showing risks due to location of air polluting industries
- Location of industries and industrial estates.

- All the maps prepared for the Atlas are being converted to digital form so that subsequent updating/modification becomes easier.

The final reports along with recommendations for siting of industries will be ready, by June 1996. for implementation (issue of notifications. guidelines, etc) and as an information tool for the public and industrialists after validating the results from the local authorities and other Government Departments and holding discussions with the local public and industries/entrepreneurs.

9.2 Objectives of capacity building

The overall objective of the program is to support the expansion of CPCB's program on Zoning Atlas.

The project is meant to involve district, state and central level environmental and planning agencies in creating environmental thematic district-level maps which would strengthen both siting and location of industry, as well as assist in monitoring and controlling industrial pollution. The program will also include training of the end-users of the maps. The various activities of the project include

- Operationalization of zoning atlas at district level.
- Training the implementing authorities and users.
- Documentation and information dissemination.

This sub-component will include:

- Updating the draft guidelines for preparing zoning atlases, to be made available to all map users.

- Including of up to 283 more districts in the mapping programme, which will require the installation of environmental planning studies in each of the participating SPCBs, with the requisite hardware, software, and training to be supervised by the core CPCB team.
- Identifying, in those districts with completed maps, both unsuitable and suitable sites for industry and industrial estates. Then, provisional guidelines for industrial estate siting will be developed and tested, finalized and implemented in all districts with completed maps.
- Drafting, starting with a case study in Gujarat, guidelines for industrial development and land-use planning on the state level, taking into account a broad range of industry, urban, agricultural, forest, and ecologically sensitive (and perhaps protected) areas.

9.3 Programme

The environmental administration in India considers environmental planning as one of the priority thrusts, leading to sustainable development, a view shared by the industry and other relevant institutions. As an indication for the need to institutionalize environmental planning, a comprehensive five year program has been prepared which can be implemented depending on the availability of funds.

Implementation of the ambitious and comprehensive program of Environmental Planning in India depends on technical and institutional prerequisites which have yet to be developed and/or strengthened. On the technical side a severe obstacle lies in the inadequacy, inaccuracy and non-compatibility of the used data from various sources. A reliable reference mapping system with needed accuracy is still lacking. On the implementation side, clear cut programs/schemes are mostly lacking. In order to assure successful implementation of the results of thematic environmental atlases not only within the PCBs but also within other authorities with a planning mandate the necessary prerequisites have to be created. Environmental planning instruments also would eventually help increase public awareness. Thus, it provides a great opportunity to create necessary conditions for sustainable development in India.

Keeping in view the present day requirements, a 5-year environmental program for the period 1995-1999 has been prepared by CPCB. The overall objective of the proposed environmental program is to create and/or strengthen technical, instrumental and institutional prerequisites and structures needed to successfully implement the program on Environmental Planning India. Specific components of the program include;

- Program management and program promotion.
- Development of environmentally compatible zoning concept for different planning aspects.

- Strengthening of cartographic/computer/planning, etc. capabilities.
- Development of appropriate zoning regulations.
- Implementation of environmentally compatible zoning plans (includes training to State PCBs and other Govt. Departments in the State and District, interaction/meets with industry/industrial associations and the public).
- Supportive studies and research.

The program will be coordinated and executed within an effective project management structure in which the CPCB will have a nodal function.

9.4 Key institutions which will be involved in planning, implementation and coordination

Planning

- Central Pollution Control Board.
- State Pollution Control Boards.

Implementation

- State Pollution Control Boards.
- Department of Industries (State & Central).

In coordination with

- Ministry of Environment & Forests.
- State Department of Environment.
- Town Planning Departments (State & Central).
- Urban Development Authorities.
- NGOs including Industry Associations, Industrial Promoters, etc.

9.5 Additional staff to be appointed

Needs would be identified during the course of the programme.

9.6 Equipment to be procured

- Computer hardware & Software (GIS).
- Cartography equipment.
- Optical pantograph.
- Light Table.
- Drawing Cabinet, etc.

9.7 Number of persons to be trained

30 persons from the district level.

9.8 Local consultant agencies

Will be identified during the course of the Programme.

9.9 Expatriate consultants agencies

- German Agency for Technical Cooperation (GTZ), Germany.

9.10 Draft terms of reference for the consultants

The consultants will assist the CPCB in preparing zoning atlas for the proposed number of districts in various years mentioned in the programme.

9.11 Indicators of progress

By the end of this period, the instrument of environmentally compatible land use management will have been introduced and institutionalized at various planning levels. The main results of the environmental planning program during 1995-1999 will be the following.

Technical

- Zoning Atlas will be available for about 283 districts, including all the priority districts that need environmental protection. Industrial estates will be identified in about 200 districts.
- State-wise mapping of sensitive zones and industrial sites will be completed and siting guidelines will be developed for all the States in the country.
- Environmental upgradation plans will be prepared for all the major problem areas (environmentally) in the country.
- Studies for ecologically fragile areas will be completed for about seven such areas.
- To bridge the gaps in implementation of the plans, pertinent environmental planning oriented research projects will be taken up.
- Infrastructure facilities including computer hardware and software (GIS) will be set up in CPCB and most of the State PCBs and regional offices of CPCB.
- Training will be provided to a number of engineers/scientists from CPCB and SPCBs.
- Environmental Planning teams will be established in almost all the SPCBs and regional offices of CPCB.

- The interlinkages will be established to introduce the above results on all the planning levels - states, districts, industrial estates, urban areas, problem areas and ecologically fragile areas - into decision making process of the concerned planning and executing authorities.

Institutional

- Existing data sources, their reliability and spatial accuracy will be assessed and technical solutions to produce results with the needed accuracy will be identified and evaluated regarding their feasibility. Feedback will be given to the resource organizations (data sources) regarding inadequacies of data so that they may include environmental parameters also into their activities and generate required data.
- The needed hardware and software will be installed and put into use by the trained staff at the Central and State PCBs.
- The PCBs will be able to play a comprehensive role in environmental planning.
- A comprehensive analysis of the existing external institutional set-up in environmental planning in India will be done and some of them will be already involved in execution of various projects.
- Instrumental and institutional prerequisites and structures within PCBs needed to successfully implement the program on Environmental Planning in India will be created and/or strengthened.
- Instrumental and institutional prerequisites and structures facilitating effective co-operation with the concerned institutions needed to successfully implement the program on environmental Planning India will be created and/or strengthened.
- Concerned private groups and the general public will be involved in environmental planning.
- An Environmental Planning Information Centre will be operational.

9.12 Linkages with other sub-components

- The proposed expansion of the Ambient Air Quality Monitoring network (Chapter 10) and the preparation of zoning atlas would need to be conceptually consistent with each other. That is, new monitoring stations would be located near proposed sites for industrial estates, urban hot-spots, and ecologically fragile areas.
- Activities proposed in this chapter would also enable the activities under Chapter 7 (Regional offices), Chapter 11 (Municipal Planning), and Chapter 12 (Coastal and Marine areas) to be successful. Thus, the concerned agencies would need to interact.

9.13 Budget (for 3 years)

Categories of expenditure	Amount (US $ million)
Consultant services	0.44
Training	1.15
Materials & books	0.39
Equipment	2.65
Other costs	9.29
Total	13.92

Chapter 10

Ambient air pollution monitoring

10.1 Introduction

Urban air pollution is worsening in almost all developing countries. Rapidly growing cities, more traffic on the roads, out dated industrial technologies, growing energy consumption and lack of industrial zoning and environmental regulations are all contributing to reduce the urban air quality and deteriorating public health.

Environmental monitoring and reporting are today an important activity of the government of both developed and developing nations. The environmental monitoring and reporting are a way of responding to public demands for environmental information. Such data banks also help in the definition, evaluation and implementation of environmental policies.

Present Monitoring Scenario

To assess the ambient air quality status the Government has launched the national ambient air quality network program in 1984. The network had 28 monitoring stations covering 7 cities. This program is operated through the respective State Pollution Control Boards and National Environmental Engineering Research Institute, Nagpur. Over the year, the number of stations have increased. The total number stations sanctioned as on March, 1992 were 290 and were spread over 92 cities and towns all over the country. Out of these 290 stations, 188 stations have already come into operation (CPCB Annual Report 1993-94).

Future approach

In this context, the continuous monitoring techniques are found to have proven applicability, both for stationary sources as well as for ambient monitoring. Today most industrialized countries have some type of air quality monitoring activity, some of which are very intensive and fully automated and others are more of manual type. The ambient air quality measurements are restricted to specific areas due to practical constraints. Mostly conventional liquid scrubbing techniques are being employed. Although these methods are still valid, it is fair to point out that most of the analytical methods are manpower intensive and sometime lack in specificity and precision in comparison with instrumental methods. The acceptability of any method should be commensurate with both air quality and emission standards.

The classical methods for sampling and analysis of air pollutants have been slowly replaced by on line instrumental techniques. In this monitoring technique the pollutant either undergoes a mechanical reaction or a physical property is used to generate an output which is converted into an electrical signal, which includes chemiluminescence, florescence, electrochemical reaction, flame ionization, flame photometry, infrared absorption, catalytic oxidation etc. These instrumental methods are used for ambient air and source sampling.

The setting up of air quality stations play a vital role for any monitoring activities. The air quality monitoring should focus on the health related criteria pollutants. Criteria pollutants are such as respirable dust, sulphur dioxide, nitrogen dioxide, hydrogen sulphide, ammonia and polycyclic aromatic hydrocarbons. In addition to the above pollutants there are some more pollutants which are known as secondary pollutants, they are lead, copper, nickel, chromium, arsenic, iron, zinc, sulphate, nitrate, chloride, fluoride, sodium and potassium. The process and concentration of any one of these pollutant depends on the sampling site. The criteria pollutants can be estimated in the following critical areas viz. industrial areas, traffic areas, mining area and residential areas.

Air monitoring program is incomplete without the measurement of wind speed, wind direction, temperature, relative humidity and vertical profile of the temperature. These studies primarily help to quantify atmospheric characteristics like transport and diffusion. Remote Sensing methods are to be used in addition to in situ measurement techniques for probing the atmospheric planetary boundary layer with gaseous tracers. These above activities are suggested to the Central Pollution Control Board, after considering their activities. The system gets strengthened by adopting the above suggested measures.

10.2 Objectives of capacity building

- To strengthen the existing air monitoring system, with the adoption of new methodologies to monitor the air quality.
- Assessing the criteria pollutants depending on the area of sampling.

10.3 Programme

The expansion of air quality monitoring programme will be carried out in phase manner.

- Siting of air quality monitoring stations.
- Identifying the area specific stations.
- Formulating uniform standard procedures (monitoring and analytical) for various pollutants.

10.4 Key institutions which will be involved in planning, implementation and co-ordination

Central Pollution Control Board

10.5 Additional staff to be appointed

There is no need for extra staff recruitment. The present staff can be efficiently used.

10.6 Equipment to be procured

Automatic air samplers and analyzers for various air pollutants. Few pollution monitoring van.

10.7 Number of persons trained

Thirty people would be trained in a phased manner. These people would be trained in modern monitoring and analytical procedures. The selected personnel would be sent for training for fifteen days.

10.8 Local consultant institutions

- National Environmental Engineering Research Institute, Nagpur
- School of Environmental Sciences, JNU, New Delhi
- Tata Energy Research Institute, N. Delhi
- Prof. J.M. Dave.
- Prof. B.B. Sundereshan

10.9 Expatriate consultants

- USEPA (United States of America)
- GTZ (Germany)
- National Institute for Environmental Studies (Japan)

10.10 Draft terms of reference for the consultants

- Helping the CPCB in identifying critical areas for monitoring. In addition to this sampling sites, the pollutants to be monitored. would also be selected with respect to sampling sites.
- Rendering training to the scientific staff in the use of GIS and remote sensing and interpreting the data.
- Assisting the research and development activities. helping them in developing new methodologies in monitoring and analytical methods.

The above TORs are applicable to both local and expatriate consultants. The local consultants will be the lead agency while the expatriate consultant will be overall advisor and provide guidance to the lead agency in implementing the above TORs.

10.11 Indicators of progress

The outcome of this exercise should be

- Efficient ambient air monitoring of health related criteria pollutants.

- Try to cover all critical and highly polluted areas.
- The data should be useful for developing new air pollution control devices for various polluting sectors.
- The monitoring frequency can be increased with the air quality status.
- The air quality data of a particular year should be published within six months of the year ending.

10.12 Linkages with other sub-components

- The ENVIS Centre at Central Pollution Control Board (See Chapter 2) would disseminate the ambient air quality data.
- The proposed expansion of the Ambient Air Quality Monitoring network and the preparation of zoning atlas (Chapter 9) would need to be conceptually consistent with each other. That is, new monitoring stations would be located near proposed sites for industrial estates, urban hot-spots, and ecologically fragile areas.

10.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.05
Training	0.21
Materials & books	0.09
Equipment	0.25
Other costs	0.08
Total	0.68

Chapter 11

Municipal planning and training

11.1 Introduction

At the Earth Summit in Rio de Janeiro during June 1992, a global plan of action named Agenda 21 was adopted with the aim to integrate environmental considerations into the development process. The programme areas include provision of adequate shelter for all, improvement of human settlement management, promoting sustainable landuse planning, provision of integrated environmental infrastructure: water, sewerage, drainage, solid waste management, effluent management etc., promoting sustainable energy and transport system, planning for disaster prone areas, promotion of sustainable industrial activities, promoting human resource development and capacity building for human settlement development.

Chapter 28 of the agenda 21 looks at local authorities' initiatives. With many of the above mentioned problems and their solutions having their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives. *The 74th Constitutional Amendment Act, 1992, envisages the entrustment of the responsibility of urban environmental management and protection to the urban local bodies (ULBs). As the level of governance closest to the people, local bodies can fulfil a vital role in educating and mobilizing the public to promote sustainable development.*

The rapid urbanization is one of the most important features today and the prevailing urbanization rate is exerting an increasing pressure on the available urban infrastructure. Cities in India, growing at an annual average rate of 3.4 to 3.8 per cent, are today faced with multiple and complex environmental problems which call for immediate attention. Firstly, the environmental-resource base of cities is depleting at a rapid rate. Secondly, the pollution levels in many Indian cities are far in excess of the "safer limits", and are among the highest in the world (on account of the changing composition of manufacturing output and increased motorization). Thirdly, most cities have accumulated (over time) problems, on the one hand, of the availability of safe water supply, sanitation, and solid waste treatment and disposal facilities, and on the other hand, of overcrowding, congestion, and encroachment on the environmentally sensitive lands.

Considering the scarcity of natural resources and environmental carrying capacity of cities, the urban areas will face greater risks from infrastructural and environmental constraints in the near future.

India's Environment Action Programme (EAP) identifies urban environmental issues as one of its seven priorities and it focuses on urban air pollution, especially in the metropolitan areas and on river and coastal water pollution, both due to industrial and municipal waste discharge. The EAP identifies that the inadequate urban services (which include urban water supply, sanitation and sewerage, solid waste collection and disposal, and transportation) is one of the major causes for deteriorating urban environment.

Physical planning

With regard to planning, the Constitution (74th) Amendment Act provides for mandatory District Planning Committee in every District to be entrusted with the formulation of District Development Plan. This Plan shall have regard to:

- Matters of common interest between the Panchayats and Municipalities including spatial planning.
- Sharing of water and other physical and natural resources.
- Integrated development of infrastructure and environmental conservation, etc.

Similarly, the Act provides for constitution of Metropolitan Planning Committee in every metropolitan area to be entrusted with the preparation of Metropolitan Development Plan which includes

- Sharing of water and other physical and natural resources.
- Integrated development of infrastructure and conservation, etc.

As may be seen from the above descriptions, District and Metropolitan Development Plans embody the concept of environmentally sustainable or carrying capacity-based human settlement development planning that takes into account the concerns of the environment. It is also likely that the District Development Boards at the State level and the metropolitan/ regional development authorities in the metropolises will be restructured to provide for decision-making power for municipally elected representatives.

Municipal training

The Constitution (74th) Amendment Act envisages the involvement of the following institutions in planning, financing and implementation of programmes for the management of urban and regional environment. These are:

- Municipalities/Panchayats.
- Special Committees and Wards Committees.
- District Planning Committees.
- Metropolitan Planning Committee.
- State Finance Commissions.

The officials and non-officials associated with these institutions need training/orientation/sensitization towards environmental issues and there is a need to equip them with tools and techniques of environmental management. The subject of environment in the form envisaged in the 74th Amendment is new to the municipal set-up and hence the special need for training of municipal officials. The critical importance of increasing their awareness on the now universally increasing recognition that development programmes and environmental protection are two mutually compatible aspects of the same agenda cannot be overemphasized.

Project appreciation

Capacity building for the urban environment will be necessary between the following levels:

Level I	Policy and Law-making	Central Government: Ministries of Urban Affairs and Employment, Environment, Ocean Development and Health, Central Pollution Control Board, Town and Country Planning Organization, etc.
Level II	Policy and Law-making, Planning and Plan Financing/ Monitoring	State Government: Departments of Urban Development, Environment and Health, State Pollution Control Board. State Town and Country Planning Department/ Directorate. etc.
Level III	Regional Planning	District and Metropolitan Planning Committees, State Government Officers at the Regional Level/District Level
Level IV	Local Planning/ Plan Implementation	Municipalities. Wards Committees. Panchayats. Municipal level officers

11.2 Objectives of capacity building

The following are the some of the areas/ components where capacity-building will be needed on priority.

- Developing a legal framework for the protection of the urban environment
- Developing Guidelines for Sustainable Development Planning based on case study of selected coastal and non-coastal cities. Also development of model sustainable development plans for the large, medium and small towns.
- Compilation of Lessons from Environmental Economics for capacity building in Municipal/Local Finance and Financial Management

- Training Needs Assessment for the Urban Environment at the 4 levels

  • training needs and capacity building efforts need to be done at four levels (I,II, III and IV). At the first two levels, i.e., central and State Govt. levels, the key officials and decision-makers involved in the development of policies and programmes for the urban environment need to be trained.

  • at the district, metropolitan and local levels, there is a need for training of the officials involved in preparation and implementation of district and metropolitan development plans so that the concepts such as carrying capacity-based planning, etc., could be ensured during the conceptualization of such plans.

  • at the local level, there is a need to orient the newly elected municipal representatives (at least 1/3 of whom will be women and who will include a large number of representatives belonging to SC/STs and backward classes). For this Group, short duration training courses are to be devised and taken up at regular intervals.
- Development of Urban Environment Data Base and preparation of formats for categories of cities. Adoption in selected project towns and dissemination of information on the findings throughout the country.

  • development of Urban Environmental Maps for these selected towns with use of GIS as a start-up with respect to above
- Institutional Strengthening: It is proposed to strengthen capabilities in institutions, namely the Central Town and Country Planning Organization. Schools of Planning and Architecture. Some of these institutions are also, already involved in the ODA-supported Urban Management Programme.
- Study tours for key officials to cities in developed and developing countries.

11.3 Programme

- Identification of existing legal framework. i.e. of national accounts. CPCB standards etc.
- Identification of salient features from the Acts. CPCB standards etc. which can be included in the manual(s) with regard to environmental management capacity building for elected representatives and for Government officials.
- Case studies of coastal and non-coastal cities in relation to Acts, regulations mentioned above and conclusions thereof.
- Identification of core environment considerations based on national/ international standards with regard to regional and urban planning and physical design in order to ensure sustainable development at town, metropolitan, district and provincial levels.
- Revenue vs cost study for infrastructure provisions such as water supply, sewerage, drainage. solid waste management including damage control costs.

- Recommendation on local taxation in relation to "Polluter should pay " principle.
- Training needs assessment for the identified 4 levels with special focus on role of women and representatives from SC/STs/OBCS.
- Study of the State of the Art of Urban Environment Management in India.
- Standardization of formats for database on Urban Environment.
- Preparation of Urban Environment maps.
- Proposals on institutional strengthening at 3 levels mainly, academics, on the job training, implementation agency including enhanced manpower needs.
- Organizing study forms for perception of the State of the Art in other developing and developed countries.

11.4 Key institutions which will be involved in planning, implementation and coordination

Considering the nodal role of the Ministry of Urban Affairs and Employment (MUA&E). It is considered necessary to constitute a Steering Committee in the MUA&E with reference to policy issues and broad direction of the programmes. The Committee may also include representatives from MoEF, Ministry of Health and TCPO. This is required since the Municipalities and District and Metropolitan Planning Committees will be the primary beneficiaries under the project and day today contacts/ interactions with the State Government and local/ regional agencies will be easy if the nodal implementation responsibility is with MUA&E. It is proposed to formulate a Project Implementation Committee at the MUA&E with representatives of Ministries of E&F, DEA, Health, Ocean Development and other Departments and officers of project-states. The Town and Country Planning Organization of this Ministry (TCPO) will be nodal agency for all training matters.

11.5 Additional staff to be appointed

The following departments/cells are considered necessary at different levels of centre, states and districts:

- Ministry (MoUA&E) may consider a separate post for urban environment with supporting staff to work with Joint Secretary (UD).
- Ministry (MoUA&E) may have an environment cell with Director (UD), Director (Local Government), Director (Urban Transport), Director (Water Supply), Director (Urban Poverty) to co-ordinate environmental matters.
- At state level, a cell with representatives from State Urban Development Departments, Local Government Departments, State Public Health Department, Public Health Board, Directorate of Town and Country Planning.

- Member and supporting staff for District Planning Committee at District level and Metropolitan Planning Committee at the Metropolitan level.
- Urban environment monitoring cell (to start with all metro cities). [Policy cell].
- Staff for the Urban/ Regional Environment Information System at TCPO to prepare database which would provide guidance to State Government on sustainable development planning.
- 2/3 environment planners with expertise in transport planning, solid waste management, etc. at TCPO (Central), and also at State levels as well as at Municipal levels (for each metro city) and at a regional level (for all non-metro cities).

11.6 Equipment to be procured

- Environment mapping and digitization through GIS/ Remote Sensing.
- Computer capabilities at the Ministry's environment cell.
- Environment quality monitoring equipments.

11.7 Number of persons to be trained

- At the National Level - 50, (representing different Ministries handling urban related matters).
- At the State Level - 5 per state.

11.8 Local consultant institutions

- School of Planning and Architecture, Ahmedabad.
- School of Planning and Architecture, Delhi.
- Regional Centre of Urban and Environmental Studies, Hyderabad.
- Tata Energy Research Institute, New Delhi.
- National Institute of Urban Affairs, New Delhi.
- Human Settlement Management Institute, New Delhi.

The suggested collaborators are

- National Institute of Occupational Health (NIOH).
- Indian Toxicological Research Centre (ITRC).

11.9 Expatriate consultant institutions

- Institute for Housing and Urban Development Studies, the Netherlands.
- Other consultancy organizations which specialize in designing

- waste handling plants
- effluent treatment plants, etc.
- environment management.

11.10 Draft terms of reference for the consultants

Activity (1): Developing a legal framework for the protection of the urban environment

- The consultant would need to examine and analyse the salient features of the existing legal framework and the environmental standards. The consultant's task also include:
- incorporation of provisions relating to protection of urban environment from National and State acts including those relating to Coastal Zone Regulation into municipal and town planning laws (Master Plans/ Structure Plans/ Outline Development Plans etc).
- preparation of a simple document highlighting the legal provisions existing in various acts for the use of municipal officials and understanding of municipal elected representatives.

Activity (2): Developing Guidelines for Sustainable Development Planning based on case study of selected coastal and non-coastal cities. Also development of model sustainable development plans for the large, medium and small towns.

The study would include

- incorporation of considerations of the environment into urban and regional planning processes/practices/methodologies
- development of guidelines for sustainable regional development planning (preparation of district and metropolitan environmental sustenance plans)
- preparation of a manual for impact assessment in respect of large and medium size urban projects to make such projects environment-friendly (and definition of 'large' and 'small' thereof)

Activity (3): Compilation of Lessons from Environmental Economics for capacity building in Municipal/Local Finance and Financial Management

Lessons from environmental economics could help development of local revenue sources for municipal bodies/regional authorities such as taxes on environmental resources and fees for use of environmental resources. Hence the consultant would need to do the following.

- development of a system of full cost recovery in the context of pricing of water supply, sewerage, drainage services, etc. where the prices should be based on operation and maintenance cost, recovery towards capital cost, depreciation, resource cost, premium attached to use of scarce resources and damage control cost linked with social damage effects is necessary.

- development of a system of local taxation based on "Polluters should pay" principles and charges for violation of environment regulations (at the same time, ensuring to stay within the prescribed limits have to be arrived at).

Training: at the 4 levels on Urban Environment

The personnel would be trained on the following topics

- Land use planning
- Solid waste management
- Industrial effluent management
- Waste water treatment/recycling
- Air pollution monitoring
- Noise pollution
- Slaughter house waste management
- Hospital waste management
- Storm drainage (Indian condition) management/ treatment/ recycling
- Public Health, Preventive Health, Disaster/epidemic management etc
- Use of the software and equipments (scanner, digitiser etc) for application of GIS

Training for trainers: Training is proposed both at national level and overseas.
At the national level, the lead consultant would train the faculty with the other consultants on the above topics.

Training at the 4 levels
The lead consultant would organise the training programmes for the municipal personnel with the help of the trainers who were already trained and other consultants.

Training on use of GIS
The consultant would train personnel from various TCPO offices from the Central and State level and also the planning departments in the metropolitan cities (who would be provided with GIS software and equipments) on the application and use of GIS.

11.11 Indicators of progress

The following are some of the indicators of evaluating the progress.

- Incorporation of environmental aspects contained in 74th amendment into the local self Government laws and state legislature (regional development plans, master plans etc).
- Setting up of environmental quality monitoring stations.
- Number of trainees successfully completing the course modules.
- Preparation of sustainable land use plans.

11.12 Linkages with other sub-components

- The Ministry of Urban Affairs would need to interact more closely with the Ministry of Environment in the matter of developing environmental indicators (Chapter 6) specific to urban areas.
- The Ministry of Urban Affairs would also need to interact with the Central Pollution Control Board in the matter of siting policy (Chapter 9).

11.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	1.02
Training	3.61
Materials & books	1.10
Equipment	2.20
Other costs	0.00
Total	7.92

Chapter 12

Coastal and marine area management

12.1 EVALUATION OF EXISTING APPROACHES FOR MANAGEMENT AND DETAILS OF PROPOSED ACTIVITIES

The coastal area is inhabited by nearly 20% of the country's population of approximately 180 million. Wastes reaching the sea either directly or indirectly through' creeks are already causing degradation in marine environment in certain areas. There are perennial and seasonal rivers carrying a variety of discharges ranging from fresh water, flood water, discharges from land-based industries, agricultural wastes, etc. The environmental problems due to the above said activities have been posing enormous stress on the marine diversity and degrade sea water quality. The unplanned developmental activities have altered coastal processes resulting into severe erosion and accretion at several locations along the coastline of the country. The population growth along the coastal areas is expected to continue with the existing growth rates and as more industrial and tourism developments are being planned in the coming years along the coastline. the demographic pressure will be aggravated by migration of people from littoral states to the coastal areas. A number of coastal developmental activities like construction of medium and small ports and harbours are being planned to cope up with the rapid industrialisation.

Even though the legislative arrangements for the management of the activities are comprehensive except the need to frame measures to regulate the activities in the ocean part of the coastal water. which is now being fulfilled through steps by Ministry of Environment and Forests and Department of Ocean Development, a number of other requirements like prescription of basic water quality criteria, EIA guidelines and standards for disposal, use classification of different water bodies and prescription of guidelines to use these water bodies are essential. Further, the present monitoring programme needs to be strengthened to cope up with the emergence of new pollutants particularly the pathogenic micro-organisms.

At present. the marine environment is managed by several agencies and an integrated approach is lacking. This has led to conflicting use of coastal and marine environment resulting several environmental problems described as above and also threatens ecology of mangroves and coral reefs, breeding and nursery grounds of endangered animals. Considering the multifarious use of coastal and marine areas being carried out at present and their likely increase exponentially in the coming years, it is essential to maintain the ecological balance while promoting the development. The ideal way to achieve the objective of protection of marine environment as well as sustainable development is to adopt the framework of Integrated management of Coastal and Marine Area Planning (ICMAMP) with the help of data and information collected in a systematic and organized pattern. Adoption of ICMAMP to deal with environmental problems has been strongly recommended under Chapter 17 of Agenda 21 of Earth Summit 1992 as well as under other forums like Washington declaration of Protection of Global marine environment from land-based activities.

To aid the development of ICMAM Plans and their implementation, the undermentioned 4 new priority projects and a project on pathogenic microorganisms to strengthen the on-going project on COMAPS are proposed to be undertaken with the financial assistance from the World Bank:

- Development of GIS based information system for critical habitats in the coastal marine areas in India
- Preparation of model Integrated Coastal and Marine Area Management Plans
- Waste assimilation capacity and ecological modelling of selected coastal areas
- Development of Guidelines for Environmental Impact Assessment studies for marine, coastal and developmental activities
- Intensive monitoring of pathogenic micro-organisms in the seas around India

The technical and financial details of each project are given under each project description.

Setting up of Project Directorate:

A project Directorate under the Department of Ocean Development will be set up at Madras to implement the project activities. The Directorate will be composed of manpower required for the implementation of the projects.

Financial Requirements

The basis requirements like project staff etc. are reflected under the projects. The requirement of Administrative staff and other recurring expenditure are given below:

	Year	I	II	III	IV	V	Total
1.	**Salaries (Project Cell)**	115000	125000	137500	150000	162500	690000
	Administrative Officer (Rs. 3000-100-4500)						
	Accounts Officer-1	80000	83000	97000	113000	133000	506000
	Messenger-2	36000	38400	40800	43200	45600	204000
2.	Hiring of Building	384000	422400	464640	511100	562200	2344340
3.	Contingencies & Operational cost	100000	150000	200000	250000	300000	1000000
	Total	**715000**	**818800**	**939940**	**1067300**	**1203300**	**47,44,340**

Approx. US $ 0.13 Million

Monitoring Mechanism:

Project Monitoring Committee (PMC) will be set up to monitor the implementation of the project.

Follow-up mechanism after completion of the Project:

The studies included in the current project are long-term in nature and the Department of Ocean Development is likely to have obligations under the Environment Protection Rules to perform similar type of activities in the coming years. Therefore, during the implementation stages of the project, establishment of a new institute will be under DOD will be considered and all the project activities will be brought under the Institute to ensure utility of results obtained from the present project. The set-up will help DOD to collect/obtain data and information required for continuous monitoring of effectiveness of the regulations proposed under the notifications and facilitate review and updation of guidelines/standards prescribed under the notification.

12.2 DEVELOPMENT OF GIS BASED INFORMATION SYSTEM FOR CRITICAL HABITATS IN THE COASTAL MARINE AREAS IN INDIA

OBJECTIVES

To develop and maintain GIS based databases to aid in the assessment and management of critical habitats and their resources.

ACTIVITIES PROPOSED TO BE UNDERTAKEN

The following activities will be undertaken under the project:-

- Review of availability of existing data and launching of Multi-Institutional projects to collect data on various parameters for the 15 areas identified as critical habitats.
- Preparation of Critical habitats Areas maps on 1:25,000 scale using IRS LISS-II satellite data.
- Integration of Satellite and field data using the ARC/INFO GIS software and development of GIS based Information System namely Critical Habitat Information System (CHIS). The system will also contain details of geographical boundaries of critical habitats both on land and in the sea.
- Interpretation and analysis of data to provide plans for efficient monitoring and management of Critical habitats.
- Organising the end user training cum workshop to Coastal State Governments and other end users with an aim of promoting the adoption of GIS based Information System in the management of critical habitats.

Data base organisation and updation

Based on the requirements, it becomes evident that the data base is of the spatial data type like thematic maps. The maps prepared will be digitized and stored in different levels in the GIS. Since the coastal zone is very dynamic, changes in the wetland will be updated at least once in a year for efficient management.

Data integration, analysis and output

In the first step the complete data stored in the GIS for the creation of Critical Habitat Information System (CHIS) for critical habitats in the Coastal regions including the Island will be integrated for various applications like buffer zone creation for the various categories like mangroves, coral reef area, site affected by erosion/accretion and other wetland degradation due to various factors.

In the second step relative/composite weightages are assigned for different information such as degradation, pollution etc.

In the third step the output from the plotter will be taken to get final maps on 1:25,000 scale for showing area that have to be conserved, developed and efficiently managed.

EXPECTED OUTCOME OF THIS PROJECT

- Generation of CHIS based data base for critical habitats in the Coastal and Marine Areas of India (including the Islands) in the form of computer package with user interactive menu and provision for updating the package.
- Output maps to show where the critical habitats have to be conserved.
- End user utilisation programme in the form of training cum workshop Guest lectures etc.
- Final report with plans for sustainable development of critical habitats in the Coastal and Marine Areas.

ORGANISATION OF PROJECT WORK

Project Team

The Project Team under the Project Directorate will oversee the activities of the project and also develop GIS based Information System for a few areas. The participating institutions will also develop CHIS for a few identified locations. The division of work between the project team and the participating institutions will be worked out at the time of preparation of detailed project report. The project will be implemented in close consultation with the Ministry of Environment & Forests (MoEF). The CHIS developed for all 15 areas will be kept with the Project Directorate for necessary usage by DOD.

Participating Institutions And Their Tasks

The following institutions are responsible for collection ground/sea-truth data for the critical habitats.

Institute	Task
Project Directorate, ENVIS Centres for MoEF, National Institute of Oceanography, Anna University, Zoological and Botanical Survey of India, Central Salt & Marine Chemicals Res. Institute, Orissa Remote Sensing Centre	Development of CHIS for 15 critical habitats.
Institute for Ocean Management, Anna University, Madras and Space Application Centre, Ahmedabad and State Remote Sensing Application Centres in Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal	Collection of satellite based data and preparation of maps required
National Institute of Oceanography, Goa and its regional centres at Bombay, Cochin & Visakhapatnam	Physical, chemical and biological aspects of critical habitats in Gujarat, Maharashtra, Goa, parts of Karnataka, Kerala & Andhra except on mangroves, seaweeds and sea grasses
Botanical Survey of India	Mangroves & seaweeds all over India
Zoological Survey of India M.S. Swaminathan Research Foundation	Bio-diversity of marine animals in all critical habitats particularly on Invertebrates
Central Marine Fisheries Research Institute, Cochin Central Inland Fisheries Research Institute, Barrackpore	Seasonal occurrence and distribution of commercially important shell and fin fishes along coastal marine areas

Central Salt and Marine Chemicals Research Institute, Bhavnagar	Seasonal occurrence and distribution of commercially important seaweeds along coastal marine areas
Fisheries College, Mangalore Cochin University, Cochin Kerala University, Trivandrum Madurai Kamraj University, Madurai Annamalai University, Parangipettai Bharathidasan University, Trichy Andhra University, Visakhapatnam Berhampur University, Berhampur University of Calcutta, Calcutta Genetic Resource Centre, Lucknow	Data on Marine organisms of the critical habitats located in the respective States (locations of the Institute/University) and all other information like Primary and secondary production.
Centre for Earth Science Studies, Trivandrum; Central Water & Power Research Station, Pune: Regional Engineering College, Suratkal: Central Beach Erosion Control Board	Data on coastal erosion, accretion in all critical habitats.

While preparing the detailed project reports, it will be ensured that there is no duplication of work done among the above agencies.

PHASING AND IMPLEMENTATION OF THE PROJECT

After the approval from the funding agency the phasing and implementation plan of the project will be as follows:

■	Recruitment of Project Staff	1-6 months
■	Collection of ground/sea-truth data Satellite data procurement from NRSA, Hyderabad and organisation of the data base	3-36 months
■	Digitization of available & collected maps at IOM and finalisation of classification system for the mapping of ECAs.	7-12 months
■	Preparation of base maps from Survey of India topographic maps	37-42 months
■	Ground truth verification and final interpretation	6-48 months
■	Creation of CZIS and final outputs	48-54 months
■	User training and feed back collection	54-60 months

NEED FOR A CONSULTANT

Since the foreign trained Indian scientist can conduct project activities, services of a foreign/Indian consultant is not required for the project.

BUDGET

A. NON-RECURRING (in Rupees)

1.	Satellite Data	50,00,000
2.	Collection of seatruth/ground truth through' Multi-institutional projects	3,50,00,000
3.	PC-Pentium (6 Nos.) & accessories	12,00,000
4.	Output film recorder	8,00,000
5.	A.O. Scanner	25,00,000
6.	Van	4,00,000
	Total	**4,49,00,000**

B. RECURRING

Year	I	II	III	IV	V	Total
Salaries (Project Cell)						
Principal Scientific Officer-2 (Rs. 3700-125-5000)	240000	264000	288000	312000	360000	1464000
Senior Scientific Officer-4 (Rs. 3000-100-4500)	460000	500000	550000	600000	650000	2760000
Cartographers-3	240000	250000	290000	340000	400000	1520000
Technical Assistant-2	100000	120000	150000	180000	210000	760000
Travels/Field visit	100000	150000	200000	250000	300000	1000000
Training courses/ workshops	--	--	--	400000	400000	800000
Contingencies & Operational cost	100000	150000	200000	250000	300000	3250000
Total	**124000**	**1434000**	**1678000**	**4582000**	**262000**	**11554000**

Total Budget (A+B) (Rs.) 4,49,00,000 + 1,15,54,000 = **5,64,54000**

(approx. US$ 1.2 million)

12.3 PREPARATION OF MODEL INTEGRATED COASTAL AND MARINE AREA MANAGEMENT PLANS

OBJECTIVES

- To develop capabilities in the development of Integrated Coastal and Marine Area Management Plans in India.
- To establish training facilities for building capacity in Coastal states for preparation of the plans.

ACTIVITIES

- Training of Indian Scientists in USA/UK on the methodologies involved in the development of ICMAMP;
- Development of model ICMAMP by the project team and associated institutions for Bombay, Madras and Sunderbans with the involvement of the State Governments. ICMAMP will be used as model examples in the training programme;
- Establishment of training facilities in India with dedicated manpower for conducting training programmes to planners in Coastal States;
- Aiding the Coastal States in the development of ICMAMP plans and Assisting DOD in the evaluation of the ICMAM Plans prepared by the Coastal States.

Training of Indian Scientists/Planners in the development of ICMAMP

Developed countries like U.S.A., U.K., Netherlands are adopting the concept of Integrated Coastal Area Management. In order to quickly acquire the knowledge and facilitate immediate development of ICMAMP in India, it is necessary to train Indian Scientists/Planners in the Project team as well as from expert institutions in India, atleast for a period for a period of one year in the following institutions:

- National Oceanic and Atmospheric Organisation, U.S.A.
- East Anglia University, U.K.
- Middlesex University, U.K.
- Coastal Zone Management Centre, Netherlands.
- Coastal Resources Center, The University of Rhode Island.
- Any other relevant organisation or university in USA/UK.

After completion of the training programme, the trainees belonging to the project team and expert institutions will become the full/part time trainers in the training courses proposed to be organised under the project.

Development of Model ICMAM Plans

Development of ICMAMP being a new field in India, guidance to developers in the form of model plans of few possible varieties will aid easy understanding of aspects and tasks involved in the preparation of plans. Therefore, using the knowledge acquired through' foreign training, model ICMAM plans along with requisite GIS based Information System will be prepared for the following areas:

- Creek, coastal and marine environment of Mumbai city.
- Estuarine, coastal and marine environment of Kochi.
- Coastal and marine environment of Madras city.
- Biosphere reserve areas of Sunderbans (West Bengal).

Justification for choosing these areas:

Mumbai is a highly populated and industrialised mega city with two major ports (Bombay & Jawaharlal Nehru) located on its coast. It provides an ideal example of a coastal city with large diversity of activities which greatly influence the quality of atmosphere and the aquatic environment. Deterioration of water and sediment quality of creeks due to discharge of wastes are already reaching a critical stage. The proposed model plan will serve an example of an area where restoration of ecology through' corrective action can be planned. Adequate information is available about physical, chemical, geological and socio-economic aspects of the city.

Kochi is one of the most industrialised cities of Kerala with high density of population. The sea off Cochin is highly productive and rich in fisheries.. Kochi has a complex network of backwaters with the upstream limit of nearly 15 km covering an area of 150 sq km. The backwaters is an area of intensive multi-various activity ranging from port activities, industrial establishments, coconut reting, tourism, inland navigation etc. Wastes generated from the city reach the sea through the complex backwater system. The backwaters are picturesque with dense coconut trees and other vegetation acting as resting and nesting areas of variety of birds and breeding grounds for marine organisms. At present Cochin is facing environmental problems like accumulation of wastes in the backwaters and erosion of coastline. A model plan for Cochin will provide an example for management of a coastal city which has large influence of inland activities and the marine environment rich in fisheries.

Madras is a fast developing mega city along the east coast with vast area promoting beach tourism and its outskirts harbouring enormous industrial establishments including a thermal power plant. It has a major port and developing a satellite port. Large scale coastal developmental activities are being contemplated in near future. The marine environment also supports fishery and is less polluted compared to Mumbai. the unplanned coastal developmental activities have been causing alteration of coastal processes resulting into erosion of northern part of the city. The proposed plan will serve as a model plan for sustainable development of a moderately developed mega city where large scale development in wide range of sectors are being planned in the immediate future.

Sunderbans is one of the largest mangrove system in India. The branches of ganges river at the delta region give rise to Hooghly-Malta complex estuarine system with a fine network of backwaters and islets having dense mangrove forest vegetation. The mangrove by its dense proproot mat enhances mud disposition specially in the upper inter-tidal zones and give resistance to bank erosion. The marshy areas with mud deposits are characterized by strong biogenic activities. The mangroves of Sunderbans act as feeding and nursery grounds for commercially important fish and crustaceans. Due to its high bio-diversity, the mangrove and adjoining areas have been declared as Biosphere reserves. The area is being threatened by deforestation, pollution due to disposal of wastes from upstream areas, siltation and desiltation. A model plan for Sunderbans will form as an example of management of one of the most critical habitats which is under threat from human activities.

Institutions involved:

Following institutions will be responsible in the preparation of the model ICMAMP for the above areas:

Area	Name of State Govt and Institutions	Tasks
Creek, coastal and marine environment of Mumbai city	National Institute of Oceanography (NIO) Goa and its Regional Centre, Bombay	Lead Organisation with the overall responsibility for preparation of the model plan.
	Department concerned in Government of Maharashtra	Associating with NIO in development of the plan, its integration with land part of Coastal zone management plan, checking its feasibility for implementation and review of the plan

Backwaters and marine environment of Kochi	Centre for Earth Sciences Studies (CESS), Trivandrum	Lead Organisation with the overall responsibility for preparation of the model plan.
	Department concerned in Government of Kerala	Associating with CESS in development of the plan, its integration with land part of Coastal zone management plan, checking its feasibility for implementation and review of plan
Coastal and marine environment of Madras	Project Team on IMCAMP	Lead Organisation with the overall responsibility for preparation of the model plan and preparation of GIS based data base for this area.
	Dept. of Environment & Forests, Govt. of Tamilnadu and other State Government organisation and Institute for Ocean Management, Anna University, Madras	Associating with CESS in development of the plan, its integration with land part of Coastal zone management plan, checking its feasibility for implementation and review of plan

Biosphere reserve areas of Sunderbans	Zoological Survey of India (ZSI)	Lead Organisation with the overall responsibility for preparation of the model plan.
	Botanical Survey of India (BSI)	To prepare GIS based Information System for Sunderbans area
	Department of Environment and other concerned departments in Government of West Bengal	Associating with ZSI in development of the plan, its integration with land part of Coastal zone management plan, checking its feasibility for implementation and review of the plan

Establishment of Training facilities in India for development of ICMAMP

India is a vast country with a coastline of 500 km. in the mainland and about 2000 km. in the islands. If an average of 25 km. wider land area from High tide line is taken as area of interaction with the marine environment to the limit of the territorial waters of 12 NM miles, the total area that need to be managed works out to be approximately 350,000 sq. km. Nearly 50% of the area are zones of intensive land and marine based activities, with large scale human interventions in the country world, has a population density ranging from 50-500/sq. km. with mega cities like Bombay and Madras situated on the coast and Calcutta near the coast. Number of cities like Mangalore, Cochin, Trivandrum, Visakhapatnam are also located along the coast. There are 11 major ports located along the coastline. There are many large, and numerous medium and small scale industries are located near and all along the coastline. There are nearly 32 critical habitats of ecological importance. As said earlier, the coastal and marine area being used to perform multi-various activities.

Considering the prevalence of multi-various activities which are thickly inter-woven, management of these activities in an integrated manner to ensure rational use of environment, needs development of appropriate size and number of ICMAM Plans. These plans will be prepared by the sectoral governments namely the coastal states who do not have adequate expertise in this field. Development of expertise on their own is a time consuming process and this will not facilitate early preparation of ICMAMP leading to time loss in the protection of environment and sustainable development in areas where degradation of environment due to human interventions is already reaching a critical stage. Therefore, establishment of a training centre by a technical department like DOD as a part of the Project Directorate at Madras to provide training in the preparation of ICMAMP will help the sectoral governments in developing expertise in the development of ICMAM Plans and facilitate quick development of the plans.

Details of courses to be provided in series are as follows:

- Organisation of theoretical courses on coastal marine activities and their impact on environment, with the help of specialists/experts in the subjects.
- Basic requirement for preparation of ICMAMP and relevance of GIS based Information System techniques as a technical aid and pre-requisite in the development of ICMAMP.
- Course on adoption of use classification and zonation concepts in the preparation of ICMAMP.
- Course on development of ICMAMP with examples model plans prepared by project team and associated institutions.

Aiding the Coastal States in the development of ICMAM plans and assisting DOD in the Evaluation of plans

The project team which has developed expertise in the development of ICMAM plans will assist the State Governments in the development of plans. As the primary responsibility of evaluation and approval of the plans rests with DOD, the project team will also assist DOD in this task.

PROJECT TEAM

Development of ICMAMP is a continuous process and the plans are periodically updated. With the progress of time there will be requirement of preparation of more plans for which more manpower will be generated by the sectoral governments which are preparing these plans. Further, new methodologies are often introduced in the development of plans.

In order to cope up with the need for development of expertise on a long term basis and to adopt the new methodologies, it is absolutely essential to establish dedicated training facilities in India. As pointed out earlier, India does not possess expertise on this field and a few selected personnel will have to be trained in foreign countries to gain knowledge on the development of ICMAMP. In order to make available the knowledge gained by these personnel to others on an uninterrupted and dedicated manner, it is essential to retain these staff for which establishment of an institutional facility like training centre is inevitable.

The Department of Ocean Development (DOD) is entrusted with the responsibility of evaluating the ICMAMP prepared by the sectoral governments and approve them. The project staff can be utilized by DOD in evaluating the plans prepared by the sectoral governments. This would ensure full utilization of the expertise gained through the training in abroad.

The project directorate proposed to be established in Madras will function as the Training centre.

NEED FOR A CONSULTANT

Since India has no experience in the development of ICMAM plans, it is necessary to have a consultant from developed countries to help India in the preparation of the model plans. However, the consultant will not be allowed to deal with areas which are declared as sensitive by the Government of India. The consultant should have following qualifications:

- Must have led a team which has prepared ICMAM plans atleast for different situations or areas representing highly industrialised & populated areas, ecologically sensitive areas etc. The plans must have been accepted by the Sectoral/provincial governments and must be in advanced staged of implementation.
- Consultant should be able to communicate freely in English.

Tasks for the consultant:

- To prepare detailed project report for the current project for submission to World Bank.
- To actively associate with the project team and other organisations in the preparation of the plans.

SCHEDULE

Selection of Project Staff	0-6 months
Training of Project Staff in abroad	7-12 months
Development of ICMAMP for one critical habitat Mumbai, Kochi, Madras and Sunderbans	13-24 months
Training of Coastal States in the development of ICMAMP	25-60 months
Evaluation of ICMAMP coastal states	25-60 months

BUDGET

A. NON-RECURRING

Training facilities (both for ICMAM & GIS)

■ Workstation with 20 Pentium and peripherals like Scanner, Laser & Ink Jet Printers	Rs. 70,00,000
■ Software like Arc info & Arc View, Oracle, Multi-Media & presentation softwares	Rs. 30,00,000
■ Office & audio-visual equipment (Audio-visual, Xerox, Fax)	Rs. 10,00,000
Total	**Rs. 1,10,00,000**

B. RECURRING

Year	I	II	III	IV	V	Total
Salaries						
Principal Scientific Officer-4 (Rs.3700-125-5000)	480000	528000	576000	624000	720000	2928000
Senior Scientific Officer-2 (Rs.3000-100-4500)	230000	250000	275000	300000	325000	1380000
Computer Assistant-2	160000	166667	193333	226667	266667	1013334
Secretarial Staff-2	100000	120000	150000	180000	210000	760000
2. Training courses	--	200000	200000	200000	200000	800000
3. Computer Maintenance	700000	700000	700000	700000	700000	350000
4. Contingencies	200000	200000	200000	200000	200000	1000000
Total	**1870000**	**2164667**	**2294667**	**2430667**	**2621667**	**11381334**

Total (Non-recurring + Recurring) (Rs.) 1,37,25,674 + 1,10,00,000 = 2,23,81,334

(US $ 0.60 million)

12.4 WASTE ASSIMILATION CAPACITY AND ECOLOGICAL MODELLING OF SELECTED COASTAL AREAS

OBJECTIVES

In India, there is growing emphasis on development of the coastal zone. Raw materials are being transported into ports and harbors. Industrial activity ranging from energy plants to tourism has increased significantly.

Correspondingly, urban towns and cities are growing rapidly. In all these locations, there is little knowledge of the environment and its capacity to sustain this developmental activity.

This project proposes to conduct WLAs for three estuarine environments currently facing water quality problems due to urban and industrial development. These systems are the Tapi estuary, Cochin backwaters and Ennore estuary. This project will help develop the indigenous expertise of personnel in this area and will spawn further WLA programmes for the remaining riverine and coastal waterways. Based on the knowledge and experience gained the WLA for the coastal environment will be taken by DOD at a later date.

DESCRIPTION OF STUDY AREAS

Tapi Estuary

The 720 Km long Tapi river originates near Muitar in Betone District of Madhya Pradesh, India at an elevation of 752 m and commands a catchment area of 6.5 x 10 Km. The shallow and wide lower zone of the river exhibits typical characteristics of a tidal estuary and experiences good tide movements due to proximity to the Gulf of Khambhat. The estuary receives voluminous freshwater flow during monsoon (July- September) the period during which the salinity is largely flushed out except in the lower reaches (about 5 km). However, after December the fresh water flow decreases several folds and seawater penetrates at least upto 50 km inland. Along the coast of the estuary, an industrial belt near Hazira which occupies over 150 Km is situated. These industries release their wastewater into the estuary. No waste assimilation capacity of the estuary has been investigated so far.

Cochin Backwaters

The Cochin Backwater a complex estuarine system, is a part of the lower reaches of river Periyar. Along this river there is an industrial belt which discharges pollutants into the estuary. This is a typical tidal estuary with an influx of fresh water at upper end and both an inflow of seawater and outflow of diluted seawater at the seaward end. A point discharges of several pollutants through waste water has deteriorated the estuarine quality to a considerable extent and unless the future developments are planned keeping in view the assimilation capacity of the estuary the condition will deteriorate further.

Ennore estuary

Ennore is situated in the North eastern part of the Madras city. The estuarine waters receive treated/untreated sewage and industrial effluent from Manali and Ennore Industrial areas which consist of many industries such as fertilizer, chemical, sugar, engineering etc. The effluent are released through the Buckingham canal. These waters also receives coolant water and effluent containing fly ash from Ennore thermal power station.

APPROACH

The most efficient method in a waste management system is determination of Waste Load Allocation (WLA) for an area based on its assimilation capacity. The WLA is best performed if the environment and its mechanism for a particular site are understood through environmental monitoring. These processes may then be input to computer model for calibration and validation. Next the application of the model will assess the advantages and disadvantages of various design options. Using a cost-benefit analysis, the best option that results in the desired water quality can then be recommended for implementation. Thomann and Mueller (1987) best describes this process for a dissolved oxygen problem in a river. Waste load allocations have been performed in several locations in US over the last two decades.

One important aspect is the choice of design condition for model application under which the WLA is to be conducted. This choice requires experience, especially since the model cannot be a complete representation of reality. The WLA may be performed for a critical summer period that allows violation of the criteria for no more than seven days once in 10 years. On the other hand, the choice may be to apply the model under storm conditions that result in inputs from overflowing drains, and increased runoff from the upstream watershed. Both these projections may be made relatively quickly and with confidence once the calibrated and validated model is in place.

Since the WLA requires a scientific assessment of the water body, it is an efficient alternative to the traditional trial and error method of setting effluent standards for various discharges. For example, municipal wastewater treatment effluent standards for BOD can be set nationwide to be 30 mg/L. While it is easy to implement for a regulatory agency, after building several expensive treatment plants, there is little guarantee that the desired water quality will be achieved in all the receiving waters. On the other hand, at some sites, violations may not occur even if the effluent were higher than the prescribed standards.

PROJECT TASKS

There are several steps required to achieve this goal. They are:

- The establishment of desirable water uses. Five water use classes in the coastal zone have been identified by the Central Pollution Control Board (CPCB) and the entire coastline of India has been broadly classified. This classification will be reviewed for these three sites and revisions, if any, will be suggested.
- A listing of water quality criteria for each of these five water use classes. Currently, the parameters listed by CPCB do not include toxic chemicals like heavy metals and organic. Several of these constituents do not degrade readily and persist in the environment in toxic forms for decades. Examples are DDT and PCBs. Site specific bioassays and biomonitoring will be conducted for toxicity criteria and will be compared to existing Indian and international criteria for seven heavy metals and five organic compounds. Amendments to the CPCB list will be recommended. The water quality criteria will be adopted for the existing and/or modified uses generated from Task 1).
- A monitoring and modeling program to determine the assimilative capacity of the waste inputs and develop a waste load allocation. Three surveys will be conducted for each site. Data from two surveys will be used for calibration and the third will be used for validation. The surveys will be conducted to cover a range of hydrological conditions to extend the predictive range of the model. At least one survey will be conducted under conditions similar to the design conditions anticipated for the WLA. The studies for physical, chemical and biological will be conducted simultaneously to present a "snapshot" of the site conditions. This is essential for model calibration. A review of existing literature and documents will be made for establishing sampling locations and making preliminary hypotheses of the major processes controlling water quality.
- This task will include preliminary interpretation of the data using scientific principles. The most important processes will be identified and modeling will focus on the water quality parameters with the most significant violations. The hydrodynamic model will be calibrated using the tide, current and dye data. An ecological model will be calibrated. Available and tested models such as USEPA's WASP5 package, Applied Science Associates WQMAP and US Army Corps of Engineers CE-QUAL will be considered for application. The modeling results will include a sensitivity analysis for model calibration parameters.
- A waste load allocation for a future condition will be conducted by defining (a) design condition(s) in consultation will local authorities, planners, scientists and the local population. The model application for WLA will evaluate various options for

wastewater discharge such as common effluent treatment plants, higher treatment efficiencies, discharging through ocean outfalls and alternative technologies such as discharges to cultured wetlands.

- A cost benefit analysis will be conducted.
- Recommendations to the Central Pollution Control Board for Implementation.

PERIOD OF STUDIES

It is envisaged that studies at each location will be over a period of five years.

DELIVERABLES

- Water quality uses for the four surface water bodies.
- Water quality criteria/standards for four areas all parameters. This will be presented at both chronic and acute levels.
- Water quantity and quality data collected from the three areas as a separate report. Listings of current land uses and existing waste dischargers and their characteristics will be included. This will be presented as a report with interpretations. The report will be presented as a hardcopy and in digitized format.
- Calibrated and Validated Models for Dissolved Oxygen and eco-toxicity.
- A management plan or waste load allocation for the three sites. The WLA will be conducted for a dry weather critical condition. The effluent discharge standards will not demand higher treatment efficiencies than the best available technology (BAT). If water quality standards are found to be impossible to achieve under current conditions, this will reflected in a change of water use classification.
- Recommendations to the State Pollution Control Boards (SPCBs) will be accompanied by a preliminary discussion of the cost-benefit, funding sources and social implications.
- Guidelines to DOD/CPCB conduct WLAs in remaining coastal waters.

INSTITUTIONS INVOLVED AND THEIR TASKS

Institution	Task
Project Directorate	Overall co-ordination of the programme and participation in modelling studies in Ennore estuary and Cochin backwaters
Lead Institutions	
National Institute of Ocean Technology, Madras	Determination of Waste Load Allocation and associated aspects for Ennore and Cochin backwaters using modelling studies
Regional Centre, National Institute of Oceanography, Bombay	Determination of Waste Load Allocation and associated aspects for Tapi estuary using modelling studies
Supporting Institutions	
Central & State Pollution Control Boards	Determination of use classification of three areas and determination of water quality criteria
Centre for Earth Sciences Studies (CESS), RITES	Collection of data on tides, currents and bathymetry
CESS, Central Electro-chemical Research Institute, Central Marine Fisheries Research Inst., Regional Centre NIO, Cochin, Cochin University	Collection of data on chemical and microbiological parameters
Central and State Pollution Control Boards	Information on existing and proposed discharges monitoring of discharges and participation in modelling studies

TASKS FOR IMPLEMENTATION AND TIME FRAMES

■ Recruitment of Project Staff, purchase of equipment	1-6 months
■ Staff training and preparation of subcontracts	6-12 months
■ Determination of use classification	6-12 months
■ Determination of water quantity criteria	6-18 months
■ Water Quality Monitoring programs (data gathering, field studies)	6-42 months
■ Water quality modeling	6-48 months

Model Application and Interaction with user groups	42-54 months
Training courses	48-60 months
Final guidelines and final report	54-60 months

INTERNATIONAL COLLABORATION

Training of Indian Scientists in any of the foreign institutes/universities is proposed

- Department of Oceanography, University of Hawaii,Honolulu
- SENES Oak Ridge Inc., Centre for Risk Analysis, 102, Donner Drive Oak Ridge, Tennessee - 37830, USA.
- Bedford Institute of Oceanography, Canada.
- Institute of Ecology, University of Georgia, Ahena Georgia
- Hydrodynamic Laboratory, Massachusetts Institute of Technology Cambridge, Massachusetts, USA
- Fisheries Laboratory, Lowestoft, Saffolk, England
- Department of Oceanography, Dalhousie University, Canada.
- University of California, Berkely
- Manhattan College, New York
- University of Rhode island
- US EPA Centre for Exposure Assessment Modelling, Athens Georgia

FOREIGN CONSULTANT

Training of Indian Scientist in the above laboratories would enable them to carry out the project activities and also the Indian Scientists have the capability to prepare the detailed project report. Therefore, foreign consultant for this project is not required.

BUDGET

A. NON-RECURRING

1.	Compilation of background data, library resource, software	10,00,000
2.	Computers and accessories (4 IBM-PC Compatibles and peripherals)	9,00,000
3.	Transport Vehicle (Pickup Truck or Utility Vehicle)	4,50,000
4.	Field and Laboratory Equipment	
	Tide gauges (24 nos.)	48,00,000
	Field meters for DO, Salinity, Conductivity, Temp, pH (8 nos.)	12,00,000
	Current Meters (18)	30,00,000
	Spectro-Fluorimeter (4)	2,00,000
	UV-VIS Spectrophotometer (4)	12,00,000
	Incubators. Filter Manifolds, Weighing Balances, Refrigerators, Dessicators. Ovens, Coolers, Microscopes, Water Samples, Glassware. Chemicals, etc.	50,00,000
5.	Sub-Contracts for Participant Institutions	60,00,000
6.	GPS / DGPS	3,00,000
7.	Atomic Absorption Spectrometer	30,00,000
8.	Travel expenses for outside India for 12 Scientists for 1 year (approx.)	36,00,000
9.	Participating Institutions	1,00,00,000
	Total	**4,06,50,000**

B. RECURRING

Year	I	II	III	IV	V	**Total**
Salaries						
Principal Scientific Officer (2 X 3700-125-5000)	2,40,000	2,64,000	2,88,000	3,12,000	3,60,000	**14,64,000**
Senior Scientific Officer (2 X 3000-100-4500)	2,30,000	2,50,000	3,00,000	3,00,000	3,25,000	**13,80,000**
Secretarial Staff-2	1,00,000	1,20,000	1,80,000	1,80,000	2,10,000	**7,60,000**
Travels/Field Visits	3,00,000	3,00,000	3,20,000	3,40,000	3,60,000	**16,20,000**
Training Courses				4.00,000	4,00,000	**8,00,000**
Contingencies and Operating Expenses	2,00,000	2,20,000	2,42,000	2.66,000	2,93,000	**12,21,000**
Total	**10,70,000**	**11,54,000**	**12,75,000**	**17.98,000**	**19,48,000**	**72,45,000**

Total Budget = 4,06,50,000 + 72,45,000 = Rs. 4,78,95,000
(approx. USS 1.85 million)

12.5 GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDIES FOR MARINE, COASTAL AND DEVELOPMENTAL ACTIVITIES

OBJECTIVES

1) Review existing literature and similar EIA statements. Develop an understanding of the impacts of developmental projects.

It is a recommended practice to develop ElAs by learning from observed environmental problems of the past and recognizing their causes. A study of previous ElAs for similar projects is also an efficient approach towards accounting for key environmental parameters.

This objective can be initiated by training personnel in universities such as the University of Rhode Island's Coastal Resources Centre, U.K.'s Imperial College or Australia's University of New England.

2) Development of guidelines for ElAs of key developmental projects.

It is impractical to expect all proponents of projects to conduct extensive research and individually determine the best approach to conduct an EIA. Several factors from different areas of expertise are to be considered. Such multi-disciplinary expertise is often difficult to organize, especially for marine projects. By providing guidelines and information to the project proponents. specific questions will need to be answered. resulting in consistent and complete assessments.

This following section indicates the methodology to be followed in developing the guidelines:

- The Project team in the Project Directorate will review previous ElAs and reports of each individual developmental activity listed in the previous section.
- A project outline will be drawn up keeping in view a similar existing developmental project. The project outline will include three basic aspects to be understood in the EIA process: the environmental setting of the project; environmental impact; and the environmental impact statement. Methods of impact analysis such as the adhoc procedures. overlay techniques, checklists, matrices and networks will be shortlisted.
- A nearby institution or university with the necessary infrastructural needs will be requested to conduct the EIA and develop the preliminary guidelines with the case study and suggested method of impact analysis.
- Feedback from user groups will be solicited prior to adopting the final guidelines.

Development of a high technology information centre for ElAs.

This data centre will have access to the GIS databases developed under Project 1, hydrographic maps, remote sensing data, literature of previous ElAs, air and water quality standards, endangered habitats and species, available scientific data specific to the Indian marine environment, wave atlases and an efficient INTERNET link for exchange of data, information of data, information and public domain software. Information can loaded on CD-ROM drives for users at a cost. This activity is a precursor to developing a multimedia training volume that can be viewed on a computer.

A training centre to conduct short term courses as part of the capacity building programs for coastal zone management.

The target audience will be planners, scientists, NGOs, environmental consultants, educators and university students.

Guidelines to accredit institutions and consultants performing EIAs.

There are several agencies conducting EIAs. Often, lack of expertise and technical ability to assess current conditions and project future conditions results in a loss to be proponent and review committee. Accreditation of institutions will ease the burden on the proponent on identifying qualified agencies to conduct the EIA.

ORGANISATION OF PROJECT WORK

A project office will be located in Madras, preferably on the premises of project directorate office to be established by DOD. A core group of scientific staff in the project office with expertise in ocean engineering, oceanography, environmental engineering and marine resource economics will be recruited. Other institutions will be utilized to gather information. and to provide consultancy, manpower and infrastructure to conduct field studies. For the training programme, the services of professional educators will be solicited. Table provides the details of the institutions and their tasks.

Institute	Task
■ Institute of Ocean Management, Anna University, Madras ■ Space Application Centre, Ahmedabad ■ State Remote Sensing Centres of Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal ■ DOD's National Ocean Information Centres (NOIS) ■ National Institute of Ocean Technology	1. Compile digitized coastal and coastal data relevant for conducting EIA studies
■ Project Directorate, Madras and National Institute of Ocean Technology	Compilation of digitized data, technical reports, EIA reports, data, journal and text books. Access data from INTERNET and other international institutions. Formulate project outlines and organize case studies. Establish INTERNET Web Site Final guidelines, final report Training programmes
National Institute of Oceanography, National Environmental Engineering Research Institute, Centre for Earth Science Studies, Centre for Taxonomic Studies, St. Joseph's College, Annamalai University, Cochin University, Andhra University, IIT, Madras, Bombay and Kharagpur	Collecting ground/sea truths to validate remote sensing data. Conducting case studies and preliminary guidelines.
State and Central Pollution Control Boards	Compilation of current Indian EIA reports. Guidelines to accredit institutions and consultants to conduct EIAs.

Tasks for Implementation and Time Frames

Recruitment of Project Staff, purchase of equipment	1-6 months
Staff Training	6-12 months
Data gathering and compilation, site visits	6-42 months
Preliminary guidelines and case studies	18-30 months
User group interactions and feedback	30-42 months
Training courses	40-48 months
Final guidelines and final report	36-48 months

DELIVERABLES

- Guidelines for conducting EIA for marine developmental projects. The guidelines will be available for individual projects and also as a collective volume as reference material for the IAA, planners and educational institutions.

  The guidelines will include examples and case studies as illustrations. Reference and information sources will be listed in the guidelines.
- A resource centre with a compilation of data for easy implementation of marine EIAs. This resource will be accessible to the public conducting such studies. This resource center will be also set up as an INTERNET Web Site for worldwide remote access.
- A minimum of four training programmes to: a) Planners and government officials; b) Non-Governmental Organizations (NGOs); c) Industrial and environmental consultants; and d) universities including educators and students.
- A final report including the guidelines, case studies, summary of available data and facilities and feedback from end users and course participants.
- Recommendations to the Ministry of Environment and Forests and Department of Ocean Development for inclusion in EIA notifications and guidelines and implementation in regulatory activities.
- Guidelines for accrediting environmental consultants and institutions.

NEED FOR A CONSULTANT

As the Indian Scientists/Engineers are being trained in abroad, an expert consultant is required.

BUDGET

A. NON-RECURRING

1.	Establishment of Internet Site	20,00,000
2.	Compilation of reports, library resources	25,00,000
3.	Computers and accessories (4 IBM-PC Compatibles read-write CD-ROM, scanner and peripherals)	12,00,000
4.	Transport Vehicle	4,00,000
5.	Case Studies	30,00,000
6.	Training of 6 Indian Scientists/Engineers abroad	24,00,000
	Total	**1,15,00,00**

B. RECURRING

Year	I	II	III	IV	Total
Salaries					
Principal Scientific Officer (2 X 3700-125-5000)	2.40.000	2,64,000	2.88,000	3,12,000	**11,04,000**
Senior Scientific Officer (2 X 3000-100-4500)	2.30.000	2,50,000	2.75,000	3,00,000	**10,55,000**
Secretarial Staff-2	1.00.000	1,20,000	1.50,000	1.80.000	**5,50,000**
Travels/Field Visits	2.00,000	2,00,000	2,20,000	2.40.000	8,60,000
Training Courses				4,00,000	4,00,000
Contingencies and Operating Expenses	2.00,000	2,20,000	2,42,000	2.66,000	9,28,000
Total	**9,70,000**	**10,54,000**	**11,75,000**	**16,98,000**	**48,97,000**

Total Budget = 115,00,000 + 48,97,000 = Rs. 1,63,97,000
(approx. US$ 0.44 million)

12.6 STRENGTHENING OF PROGRAMME ON COASTAL OCEAN MONITORING AND PREDICTION SYSTEMS (COMAPS) OF DOD

AUGMENTATION OF COMAPS PROGRAMME TO EXPAND MONITORING OF POLLUTION DUE TO MICRO-ORGANISMS

The West and east coasts of India particularly the coastal areas of Kerala, Tamilnadu, Andhra, Orissa and West Bengal have potentials for development of brackishwater aquaculture. Recently 0.5 million hectares have been brought under extensive and semi-intensive prawn farming. The boom of export of this high value product led to rush for development of coastal land for practising prawn farming. Adoption of non-scientific method of farming resulted into proliferation of prawn and fish diseases in the aquaculture farms. The wastes containing microorganisms like bacteria, virus etc reach the marine environment contaminating the ambient and adjacent sea water. As the same water, probably, diluted, forms intake water for prawn farms, the diseases got aggravated.

In order to keep a watch on the occurrence of pathogenic microorganisms and advise the aquaculture industry on the intake seawater quality accordingly, it is proposed to intensify monitoring of pathogenic organism using the expertise available in few more institutions, as the existing institutions under the COMAPS programme particularly along the east coast do not have capacity to conduct these studies in large areas. Morever, they are fully engaged with other activities of the programme. The present proposal deals with three major aspects in the areas of microbiological pollution monitoring in the sea, development of diagnostic kits and establishment of culture centres. The latter aspect is being taken specifically as there are no such programme being undertaken at present.

Intensive monitoring of marine environment for microbiological pollution along the East and West coasts of India.

The Indian coastal environment has been monitored for microbiological pollution for the last several years under the COMAPS programme. However some of the stretches in Tamilnadu and Andhra have not been covered in detail due to lack of adequate expertise in COMAPS institutions. More emphasis should be given to these areas as prawn farms are proliferating in these states. Besides, the monitoring should be from sea to inland creeks as this would facilitate tracing of the source, which is one of the essential requirements of COMAPS programme. The expertise available in coastal Universities and other institutions can be used for this purpose. To facilitate intensive monitoring, particularly in areas of intensive prawn farming in Kerala, Tamil Nadu and Andhra, it would be necessary to take this as a separate programme under the COMAPS. The details of institutional arrangements to carry out this programme are given below.:

Area	Institution
Trivandrum to Tuticorin	Department of Aquatic Sciences, Kerala University, Thiruvanandapuram
Tuticorin to Mandapam	Regional Centre, Central Marine Fisheries Research Institute, Cochin
Mandapam to Nagapattinam	Madras University and Tamilnadu Vertenary College, Madras
Madras to Nellore	Central Institute of Brackishwater Aquaculture, Madras
Nellore to Visakhapatnam	Field Unit of Central Institute of Fisheries Education, Kakinada

The monitoring will be carried out for a period of 5 years.

Developing infrastructure facilities and capabilities for monitoring and control of fish and prawn diseases.

One of the major problems in the management of coastal waters is presence of pathogenic bacteria. As these waters are routinely used for coastal activities especially for aquaculture, new methods have to be developed for efficient and quick diagnosis of pathogenic bacteria. The methods should be in the form of field kits so that a technician or an aquaculture farmer can easily recognise the pathogens well in advance so that he can take suitable steps to control major problems. These kits are not available currently in India.

The following institutions will be involved in this activity:

- Madras University for development of tissue culture laboratory and diagnostic kits for viral diseases;
- Central Institute of Brakishwater Aquaculture (CIBA) Madras for strengthening the existing facilities for disease diagnostics;
- Fisheries College, Mangalore for bacterial disease diagnostics and preparation of vaccines;
- Central Marine Fisheries (Madras/ Cochin) fish diseases, preparation of identification manuals for field use etc.;
- Tamil Nadu Veterinary College, Madras for histopathology and diagnostic kits for viral diseases (to be implemented in association with the Madras University);

- Department of Environmental Studies, Cochin University for establishing a tissue culture laboratory and work on viral and bacterial diseases; and
- National Institute of Oceanography, Goa for establishing tissue culture laboratory and work on molecular aspects of diseases, preparation of diagnostic.

Secondly, there are no culture collection centre for these organisms for reference work. This is a serious problem. Even though hundreds of bacterial pathogens have been routinely isolated from all the coastal waters under the COMAPS programme, no reference centre has been established so far. Besides, several pathogens are also being isolated from aquaculture farms and they need to be maintained in a culture collection.

The following institutions will act as Culture collection and repository centres:

- Fisheries College, Mangalore - for establishing a National Type culture Collection Centre for bacterial and viral strains (Aquaculture ponds). This fund includes additional space and infrastructure facilities
- National Institute of Oceanography, Goa - for establishing National Type Culture Collection for Marine Bacteria (coastal waters). This includes additional space and infrastructure facilities

The above centres would function as national reference centres for pathogenic marine bacteria and viruses. Even though the funds are inadequate for complete set up, once the facilities are set up, after 2 years, depending on the performance and need additional funding can be made available.

Thirdly, establishment of a fully equipped shore laboratory for diagnosis of fish and prawn diseases and also field advice centres with adequate infrastructure facilities should be supported. It is understood that the Ministry of Agriculture have already taken a few steps through CIBA for establishing a full-fledged laboratory for disease diagnosis. In order to facilitate the fish and prawn farmers to have access to this facility, it is advisable to establish field centres under the Aquaculture Foundation of India, Madras with the initial infrastructure coming through Government of India funding. The field centres can sustain its operations through revenue arising out of consultations provided to the farmers. it is proposed to support the Aquaculture Foundation of India with an initial grant to establish a consultancy service through its interaction with other participating institutions. The AFI can establish computer communications locally as well as internationally (through Internet) for advising the farmers.

ANTICIPATED OUTPUT

- Systematic data base on pathogenic micro-organisms along the east and west coasts of India, with information on source of these organisms.
- Field kits for diagnosis of diseases

- National level repositories on Micro-organisms causing diseases in fish and prawns which help in R & D activities on control of diseases.
- Field level diagonistic centres to aid the prawn farmers in identification of diseases and treatment of diseases.

TIME SCHEDULE

■ Organisation of programmes	0-6 months
■ Monitoring programmes	7-60 months
■ Development of field kits & testing their efficacy 7-60 months	7-60 months
■ Establishment field centres	13-16 months

FOREIGN CONSULTANT

Since Indian institutions possess adequate expertise to deal with the project activities services of a foreign consultant is not envisaged.

BUDGET

	Year	I	II	III	IV	V	Total
1.	Multi-Institutional Monitoring programme	10,00,000	15.00,000	15,00,000	15,00,000	15,00.000	70,00,000
2.	Development of field diagnostic kits	30.00,000	30.00.000	30,00,000	30,00,000	20.00.000	1,40,00,000
3.	Establishment of culture collection centres	10,00,000	30,00,000	30,00,000	30,00,000	10,00.000	1,10,00,000
4.	Establishment of Field diagnostic centres	10,00,000	5.00.000	5,00,000	--	--	20,00,000
	Total	**60,00,000**	**80,00,000**	**80,00,000**	**75,00,000**	**45,00,000**	**3,40,00,000**

Approximately US $ = 0.92 million

Chapter 13

Environmental awareness

13.1 Introduction

Under Education Training and Information, the two ongoing programmes are National Environment Awareness Campaign and Paryavaran Vahini Programme.

National Environment Awareness Campaign was created in 1986 to stimulate environmental awareness at all levels of the society. Under this programme a wide variety of activities are funded within the existing government and non government organizations. During 1994-95, over 2,200 organizations including NGOs, schools, colleges, research institutions, women and youth organizations etc. were provided funds to undertake awareness activities. The activities ranged from training courses, seminars, workshops and public meetings to rallies, exhibitions, essay competitions debate and poster contests, folk dances and street theater. Activities also include distribution of environment education resource materials.

Nineteen organizations located in different parts of the country were designated as Regional Resource Agencies (RRAs) for assisting the Ministry in planning. implementing, monitoring and evaluating the activities of the NEAC in their respective area. The RRAs play a key role in selecting the participating agencies for the campaign programme and implementing the campaign in their area.

Paryavaran Vahini Scheme was launched during 1992-93 to create environmental awareness through people's participation and reporting on violations on environmental legislation and environmental degradation. So far 130 districts have Paryavaran Vahinis and there is a plan to expand the scheme by an additional 130. The Vahinis are functioning under the charge of the District Collectors who take follow up action on the complaints received from the members by pursuing the matter with the respective authorities.

NGO Environment Action Fund, is being established to empower the NGOs to carry out discrete environmental mitigation action projects. The Fund will be piloted in Gujarat and concentrate on emergency and specific environmental problems.

13.2 Objectives of capacity building

- To review the existing NEAC & PVP programme.
- To build capacities by training government officials and NGOs.
- To build capacities by training of educators, students and media persons.
- To establish an NGO Environment Action Fund.
- To develop facilities (computers, resource material, books etc.) to facilitate capacity building.

13.3 Programme

As a lead consultant CEE along with the Ministry of Environment and Forests will coordinate the capacity building programme. All the activities will be based in Ahmedabad.

Phase I

- Identify local and expatriate consultants.
- Methodology workshop.
- Identify a secretariat for establishing the NGO Environment Action Fund.
- Review of the existing programme.
- Identification of the additional regional resource centres for NEAC & PVP.
- Planning workshop
- Networking

Phase II

- Identify trainees
- Develop three categories of training modules for; NEAC, PVP and NGO Environment Action Fund. Under each there would be 5 categories; Government officials, NGOs, educators. students and media persons. There will be 15 modules in total.
- Evaluation of the training modules and training programmes.
- Evaluation of the media campaign.
- Review and one survey in each sub-component.
- Planning for the next year.

National Environmental Action Campaign

This sub-component would include work in the following areas:

- Support for management. procedures, and target audience impact studies focusing on options for the programme's evolution to a national level.
- Appropriate staff training.
- Strengthening existing support centres CEE and CPR EEC in order to design, produce and train for a new creation of environment action instruction materials.
- Train the media persons and NGOs to orient them toward environmental consciousness.
- Launch a new media campaign.

The Paryavaran Vahini (PV) (Environmental Brigade)

This sub-project would include:

- a review of the existing 130 established Paryavaran Vahinis;
- identify exemplary practices and procedures;
- train MoEF Regional Office staff, NGOs, educators, students, responsible for existing and projected Paryavaran Vahinis in community-based training of trainers techniques and evaluation;
- train State Department of Environment staff to coordinate the district based Paryavaran Vahini members (both for community awareness activities and soil and water monitoring); and
- support an accelerated three year program of Paryavaran Vahini establishment and member training for an additional 130 districts for an end of project total of 260. Refresher training for existing Paryavaran Vahini members (2,600) would be combined with induction training for the 130 additional Paryavaran Vahinis to be established.

NGO Environmental Action Fund

Implementation of the strategy includes funding NGOs for environmental awareness and action activities. Several international donors would provide funds for small NGO education and awareness programs. The project will support the establishment of a Fund for discrete environmental mitigation action projects to be carried out by larger NGOs or consortia of smaller NGOs to carry out community-based projects. The Fund will give priority to emergency and other specific environmental problems emanating from the chemical, and mining industries, and other sectors as they relate to port development, waste management, siting of industrial plants, and coastal area development. Although the Fund will be national in scope, NGOs in Gujarat would be the major beneficiaries for this Fund.

The first step is to conduct a National level Workshop for Government officials, NGOs, corporate sector in Gujarat to address the various issues for functioning of the Fund. Agenda of the workshop will be to decide on:

- Establishing a Secretariat for the Fund.
- Identifying one large NGO and further identification of smaller NGOs in each district.
- Developing a mechanism for collecting funds.
- Establishing equations with the NGOs and the corporate sector.
- Discussions on the overview of the activities of the Fund.

This will need specialized training of the officers who will be responsible for collecting the fund. At the end of two months another workshop can be organized to assess the work being done in each district. Fund generation is an ongoing activity on which the whole structure of the programme will depend.

13.4 Key institutions which will be involved in planning, implementation and coordination

Government

- Ministry of Environment and Forests; Education Training and Information Division.
- Regional Centres of Ministry of Environment and Forests

NGOs

- Centres of Excellence;
  - Centre for Environment Education, Ahmedabad.
  - CPR Environment Education Centre, Madras.
- Regional Resource Agencies.
- District Collectors' office.
- Secretariat.

13.5 Additional staff to be appointed

Trainers to train the trainees.
10 officers and 30 assistants for NGO Environment Action Fund.
Local and expatriate consultants.
Additional regional resource agencies as evaluators.
Additional regional offices of the Ministry for monitoring and evaluation.

13.6 Equipment to be procured

International databases for referencing in formulating instruction resource material
Computers for each RRA, district collector's office and 10 officers for NGO EAF.
Internet connectivity for easy access to the latest information and to be well connected.
Subject based books on environment education, for each component of the environment.

13.7 Number of persons to be trained

For NEAC: 2 officials from each of the 19 regional resource agency will be trained
2 X 19 = 38 trainees.
For PVP: 40 trainees
For NGO Environment Action Fund: 10 officials for coordination of the Fund in all 19 districts in Gujarat.
3 assistants per official for carrying out liaison work with the donors and NGOs. 1 assistant per official to be trained under the capacity building. 20 trainees.Media persons: 20 trainees.
Total: 118 trainees.

13.8 Local consultant institutions

The Centre for Environment Education, Ahmedabad will be the main coordinating agency. CEE will consult and take inputs from other expatriate and local consultants for the capacity building programme. Some of the other consultant institutes are:

- CPR-EEC, Madras
- Indian Environmental Society
- WWF-India
- Kalpavriksha
- Eklavya

13.9 Expatriate consultant institutions

- UNESCO-UNEP's Division of Science, Technical and Environment Education.
- North American Association of Environment Education, Ohio, USA.
- National Centre for Environmental Education, Lusaka, Zambia.
- Centre for World Development and Education, London, UK.
- WWF-International.
- Global Education Associates, New York, USA.
- Australian Association of Environmental Education, Queensland, Australia.

13.10 Draft terms of reference for the consultants

The role of consultants is to provide inputs to the whole capacity building programme from the planning stage through implementation and evaluation.

Lead consultant:

CEE will be responsible

- To conduct a methodology workshop.
- To supervise the whole programme.
- To coordinate all programmes with the expatriate and lead consultants.
- To coordinate all workshops, training programmes and teaching material.
- To provide technical inputs in formulating instructional material for trainees and orienting the faculty.
- Liaison with the media persons for popularising efforts in environmental awareness by an ongoing media campaign.

Expatriate consultants:

- Provide a global outlook to the whole programme by bringing in the experiences of their countries.
- Give technical guidance and suggestions in formulating the modules.

Local consultants:

- Give inputs for component specific training programmes and surveys.
- Help the lead consultant to conduct a methodology workshop.
- Work with the lead consultants to supervise training programmes.
- Provide technical assistance and guidance for preparing instructional material to train the trainees.
- Orientation of the faculty toward specific environmental problems.
- With other faculty train the trainees in their respective sub-components in the workshops to spread environmental awareness.

13.11 Indicators of progress

A component such as environmental awareness and education is one in which there is no direct indicator of progress. The attitudinal and behavioral changes in the social groups give the indication on whether the population is becoming environmentally aware. However. for any programme to be evaluated effectively, the indicators of progress must be clearly spelled out. In capacity building of environmental awareness these indicators have been classified into qualitative and quantitative.

Quantitative indicators:

- Number of trained trainees for conducting the training programme.

Qualitative indicators:

- Evaluation of training programme, training modules, course material.
- Evaluation of the media campaign.
- Evaluation of surveys and pilot training programmes.

13.12 Linkages with other sub-components

- The division should consider further identification of regional agencies and NGOs for expanding the current programme. Also enough emphasis should be paid on the implementation and evaluation aspects.

- The division should also upgrade the training of the trainees at NGO level who will be actually implementing the programme and introduce refresher training of the officials involved in these programmes.
- It is also suggested that the monitoring of NEAC be increased from 20% to 50%.
- For NEAC, the time of implementation should be increased from 4 months to at least 1 year. Also there is need to spread the campaign to a wider area.
- Current activities and their expansion will require scaling up of the financial support for both NEAC and PVP.
- Development of environment education and awareness material in all languages.
- A two-way interaction is envisaged between ENVIS activities (Chapter 2) and NGO programmes. NGOs ought to be trained to use the ENVIS network; at the same time there must be some mechanism by which data gathered at the grass-roots level by NGOs can be fed into the ENVIS databases. The existing ENVIS centre at WWF-India could be the focal point for these activities.
- A link would be maintained between activities proposed under this chapter and those under Chapter 4 (Environmental Law).

13.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.88
Training	0.56
Materials & books	0.02
Equipment	3.76
Other costs	0.03
Total	5.25

Chapter 14

Gujarat State Environment Action Plan

14.1 Introduction

Environmental management at a state level requires a comprehensive environmental action plan to orient the programs and projects towards critical issues and state specific problems which can help achieve better results in environmental management. Accordingly, a State Environmental Action Plan is proposed to be prepared for Gujarat.

14.2 Objectives of capacity building

The program involves

- Preparation of State Environment Action Plan (SEAP) document.
- Consultations with concerned agencies, departments.
- Workshops to discuss the action plan at various stages.
- Specialized training for selective offices for imparting the skills to prepare and implement the SEAP.

Preparation of SEAP includes the major objectives as;

- To assess the environmental scenario in Gujarat.
- Review the currents policies and programs which address the various environmental problems of the State.
- To identify the future direction and thrust of these policies and programs to establish priorities and outline a strategy for the implementation of those priorities.
- To identify the programs and projects for a sustained flow of investments for improved provisioning of environmental services for better quality of life and for integrating environmental concerns into development projects.
- To identify projects for organizational strengthening for better environmental management.

14.3 Programme

The plan of action essentially involves:

- Carrying environmental assessment studies
- Involve all the concerned state level departments and agencies through workshops to discuss the state environmental action program
- Carry out a review exercise and set future priorities
- Identify projects/programs and delineate projects for organizational strengthening

14.4 Key institutions which will be involved in planning, implementation and coordination

Planning

- Department of Environment, Government of Gujarat.
- Gujarat Pollution Control Board.
- Gujarat Ecology Commission.

Implementation

- Department of Environment, Government of Gujarat.

In co-ordination with

- Ministry of Environment & Forests.
- Central Pollution Control Board.
- Gujarat Pollution Control Board.
- Gujarat Ecology Commission.

14.5 Additional staff to be appointed

No extra staff needed.

14.6 Equipment to be procured

Computer (hardware and software).

14.7 Number of persons to be trained

Inland training - 10 officials
Overseas training - 4 to 5 officials

14.8 Local consultant institutions

Will be identified during the course of the programme. Suggested resource organizations are those that were involved in preparing the National Environmental Action Plan.

- Indian Institute of Public Administration, New Delhi
- Tata Energy Research Institute, New Delhi
- Centre for Environmental Science & Engg., I.I.T., Bombay
- Indian Institute of Forest Management, Bhopal
- Indira Gandhi Institute of Development Research, Bombay

14.9 Expatriate consultant institutions

None required

14.10 Draft terms of reference for the consultants

The consultants will assist the key institution(s) in

- assessing the environmental status (air, water, land, noise, etc.)
- review current policies, programs, identify thrust areas, future directions & programs
- identify programs/projects for sustainable development, and needs for institutional strengthening

14.11 Indicators of progress

- Hotspots from (environmental angle) in the state identified for developing and initiating action plans
- Priorities for environmental actions and ideas about the type and nature of programs for action plans
- Action plans for improving the environmental status available at the end of the exercise

14.12 Linkages with other sub-components

- This sub-component would be linked to activities under Environmental Indicators (Chapter 18), and strengthening of Gujarat Ecology Commission (Chapter 17).

14.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.81
Training	0.06
Materials & books	0.00
Equipment	0.26
Other costs	0.06
Total	1.27

Chapter 15

Department of Environment and Forests

15.1 Introduction

Department of Environment and Forests at state level is delegated with responsibilities to protect environment under the Environment Protection Act. Being the nodal department holding key responsibilities, it is very important to equip this department with sufficient technical skilled manpower and requisite equipment/instruments for enabling its efficient functioning. Keeping these aspects in view, the strengthening requirements of the department of environment have been identified and are given below.

15.2 Objectives of capacity building

Strengthening of the DoEG essentially requires

- Training/Upgrading the skills of the technical cell in the DoEG
- Instruments/equipment for DoEG
- Computer hardware/software facilities for DoEG
- Supporting Environmental Research/database studies

15.3 Programme

The details of these activities along with the estimated budgetary requirements are as follows;

Training/Upgrading the skills of the Technical Cell of the DoEG: The technical and scientific personnel in the Technical Cell of the DoEG needs training in some of the following aspects to enable function in a better way in planning for environmental policy planning, implementation and effective monitoring in the State

- Monitoring of pollution, environment, air emission, liquid discharges and solid waste disposal
- Environmental Management
- EIA & EMP of industrial and other major development projects
- Preparation of coastal management and monitoring plans
- Environmental audit
- Clean technologies
- Environment education and research
- Carrying out surveys and creating database

- Review of current policies and environmental regulations
- Exposure to contemporary technology and environmental management experiences in developed countries

The various programmes proposed for training the DoEG personnel are as follows

- Training for Technical cell (14 officials) - in India
- Training for selected officials of the Technical Cell - Abroad
- Training for Senior officials (10) of the DoEG - Officials in the Environment, Forest areas - in India
- Training for selected senior officials (4) of the DoEG - Abroad
- Training for selected officials (4) on coastal management - Abroad

Environmental Research/Databuse studies: The Department plans to initiate research studies for developing information/database on the various crucial environmental aspects and the capabilities in the State. Studies which are proposed to be undertaken include the environmental impacts on coastal regions mainly Gulf of Kutch, environmental studies in non-coastal areas of the State, inventorisation of the environmental research capabilities of various institutions in the State, etc.

15.4 Key institutions involved in planning, implementation and coordination

Department of Forests and Environment, Govt. of Gujarat

15.5 Additional staff to be appointed

None

15.6 Equipment to be procured

Instruments/Equipment: Under the Environment Protection Act, the Govt. of India has delegated powers to the State Govt. To fulfill these requirements, monitoring becomes an essential activity of the Department. Moreover, it has been felt that monitoring is the weakest link in the environment compliance. For this purpose, the technical Cell of the Department is proposed to be equipped with mobile vans and environmental monitoring instruments.

Computer hardware & software: This is an essential requirement to build-up a strong computerised environmental database for the state and network it with the Guj. State Pollution Control Board and its regional/sub-regional offices in the State. A central workstation with a few terminals connected within the DoEG and networking with GPCB along with the necessary software including the databases are the essential requirements for developing such infrastructure with the DoEG.

15.7 Number of persons to be trained

36 officials of different levels

15.8 Local consultant institutions

- Universities (Bhavnagar, Saurashtra, etc.)
- Consultants for training to be identified
  Suggested resource organizations are
  - Tata Energy Research Institute, New Delhi

15.9 Expatriate Consultants agencies

None

15.10 Draft terms of reference for the consultants

The consultant(s) will assist the key institution in

- carrying research studies including environmental impacts on coastal regions mainly Gulf of Kutch, environmental studies in non-coastal areas of the State
- inventorisation of the environmental research capabilities of various institutions in the State, etc.
- Train the officials at various levels in environmental aspects as per the requirements

15.11 Indicators of progress

- availability of trained manpower in environmental technology and management
- useful research output available for planning coastal and non-coastal areas of the state
- inventory of environmental capabilities available for planning environmental programs for the state

15.12 Linkages with other sub-components

- The Department of Environment and Forests would be the common element for all activities undertaken in the state.

15.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.53
Training	1.28
Materials & books	0.00
Equipment	0.35
Other costs	0.00
Total	2.16

Chapter 16

Gujarat Pollution Control Board

16.1 Introduction

The pollution control boards at the state level are the key agencies responsible for regulating and control of pollution from various sources. The institutional aspects of the boards have been felt to be strengthened in terms of revamping the systems and strengthening the organization for imparting various skills and supportive equipment required for enabling the state pollution control board function effectively and efficiently in regulating and controlling the pollution all over the state. These requirements have been put under the program for strengthening of the gujarat pollution control board.

16.2 Objectives of capacity building

The capacity building program essentially includes two components, viz.,

- Developing Environmental Management System.
- Assisting implementation of a mixed policy model to achieve improved compliance rates.

The detailed objectives are as follows:

- To develop environmental management system (EMS) to
  - achieve improved compliance rates by both large and small scale polluting industries
  - encourage the adoption of clean technologies create adequate incentives to encourage voluntary compliance and International Standard Organization (ISO) certification by business groups and business leaders.
- To assist implementation of mixed policy model (mixed policy model is a synthesis of command and control, pollution charge, and public information approaches) which is expected to achieve marked improvement in industrial compliance rates within two to three years.

16.3 Programme

Development of EMS would include

- training of manpower
- inputs from experiences of other countries regarding implementation of pollution charge and public information program.

Implementation of mixed policy model

- The first phase of the program will include
  - establishing realistic and measurable pollution abatement targets
  - proposing and discussing with industry a phased program of introducing a new mixed policy approach
  - assessing and addressing inter-agency regulatory overlaps, and
  - redesigning existing regulations, monitoring systems, and enforcement procedures, and institutional arrangements (if necessary).
- The second phase would cover implementation of the program for the target area (all of Gujarat or a smaller area as decided in the first phase).
- The third phase would include regular assessment and reporting on program achievements and expansion of the program into either additional pollutants, or additional geographic areas.

16.4 Key institutions which will be involved in planning, implementation and coordination

Planning

- Gujarat Pollution Control Board (GPCB).

Implementation

- Gujarat Pollution Control Board (GPCB).
- Department of Forest and Environment, Gujarat.

In co-ordination with

- Ministry of Environment & Forests, New Delhi.
- Department of Industries, Gujarat Government.
- Industry associations, individual industries in Gujarat.
- Central Pollution Control Board, New Delhi.

16.5 Additional staff to be appointed

Required for strengthening the GPCB head office and the proposed new sub-regional offices.

16.6 Equipment to be procured

Air quality, water quality, noise measurement equipment

16.7 Number of persons to be trained

- About 100 officials on environmental management system
- About 150 officials on mixed policy model

16.8 Local consultant institutions

To be identified during the course of the programme.

16.9 Expatriate consultant institutions

- US State EPA

16.10 Draft terms of reference for the consultants

The consultants will assist the key institutions in

- developing environmental management system for the state
- training the officials of GPCB and others
- share experiences from developed countries

The consultants will assist the key institution in

- formulating the programs for implementation of mixed policy model in the state
- training the officials of GPCB and others

16.11 Indicators of progress

- increased between the industry and the Govt. (GPCB. etc.)
- improved compliance rates by industries
- awareness and cooperation from industries

16.12 Linkages with other sub-components

- Information and data generated through capacity building of GPCB will provide inputs for the State Environment Action Plan (Chapter 14) and Integrated Coastal and Marine Areas Management (Chapter 19).

16.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.66
Training	0.39
Materials & books	0.09
Equipment	1.12
Other costs	2.82
Total	5.08

Chapter 17

Gujarat Ecology Commission

17.1 Introduction

Gujarat Ecology Commission is involved in many innovative studies related to documentation of ecological aspects at the state level and bringing people together in acting over environmental/ecological protection in the state. From its small size as of today, it needs to be expanded and strengthened to widen its activities and horizons in developing more useful environmental/ecological information and research base which can assist and together with the state environment department and pollution control boards be an excellent effort in driving the environmental management efforts in the state. The capacity building requirements of the Gujarat Ecology Commission are identified and drafted below.

17.2 Objectives of capacity building

The overall program includes two parts, viz.:

- Strengthening Gujarat Ecology Commission
- Institutional Development

The proposal for strengthening Gujarat Ecology commission includes a 3 year project for undertaking various programs as listed below:

- Documenting current status of environment/ecology
- Developing future scenarios
- Creating awareness through
    - NGO networking
    - Area-specific communication strategies
    - sensitization on gender issues
- Carrying Research studies
- Developing and strengthening people's institutions
- Evolving policy guidelines

17.3 Programme

The plan of action essentially includes conducting ecological status studies for the states in the first two years simultaneously followed by networking of grassroot NGOs for creating environmental awareness in the villages and motivate environmental protection activities in the common public through strengthening people's institutions and regular interaction with them.

17.4 Key institutions which will be involved in planning, implementation and coordination

Planning

- Gujarat Ecology Commission, Vadodara
- Department of Environment, Gujarat Govt.

Implementation

- Gujarat Ecology Commission, Vadodara
- Department of Environment, Gujarat Govt.

In co-ordination with

- Ministry of Environment & Forests, New Delhi

NGOs including

- Centre for Environment Education (CEE)
- Gujarat Ecological Society
- Gujarat Institute of Desert Ecology (GUIDE)
- Vivekanand Research & Training Institute (VRTI)
- Grassroot NGOs in Gujarat

17.5 Additional staff to be appointed

Experts in specific fields required

Experts needed for research studies,

2 satellite data interpreters
1 soil scientist
1 botanist
1 hydrologist
1 economist
1 geologist
1 zoologist
1 sociologist
1 computer expert

For NGO networking

Senior coordinator
Coordinators

Grass root NGO coordinators (10 nos.) to
cover 100 NGOs by each coordinator 1 each for
2 districts Editor
Translator Other staff

17.6 Equipment to be procured

- Equipment (for interpretation of remote-sensing data)
- Computer hardware & software

17.7 Number of persons to be trained

None

17.8 Local consultant institutions

- Universities (Baroda, Bhavnagar, Saurashtra, etc.)
- Research organizations such as
  - Central Soil and Moisture Conservation Research Institute, Bhavnagar
  - Fodder Research Centre, Jhansi
  - Central Arid Zone Research Institute, Jodhpur
- Other consultants to be identified on need basis

17.9 Expatriate consultant institutions

None

17.10 Draft terms of reference for the consultants

The consultants will assist GEC

- in preparing ecological status studies (spatially and temporally) in Gujarat State and developing future scenarios
- carrying research studies to develop situation specific solutions to ecological degradation problems in the state

17.11 Indicators of progress

- ecological status reports for Gujarat State available for study groups
- active representation of environmental pressure groups in major development projects
- availability of findings from research studies as inputs for action plans for ecological restoration in the state

- environmental awareness and active support of public (to the Gov.t. and related agencies) for environmental/ecological actions in the state.

17.12 Linkages with other sub-components

- GEC would serve as one of the main coordinators for the preparation of the State Environment Action Plan (Chapter 14).

17.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	2.53
Training	1.09
Materials & books	1.03
Equipment	0.18
Other costs	0.56
Total	5.39

Chapter 18

Environmental indicators

18.1 Introduction

Environmental indicators are of various types. Choosing appropriate indicators is a difficult task and there are various factors that are involved in their choice. For various broad categories of environmental problems (forestry, biodiversity, land quality, air pollution, water pollution, etc.) indicators would need to be developed. In some cases such as air and water pollution, indicators have been established and used in the developed world. However, in cases such as biodiversity, there is much less experience to draw upon.

A typical framework is the Pressure-State-Response (PSR) framework developed by the OECD. The framework distinguishes three different aspects of an environmental problem: the pressure that causes the problem; the state of the environment that results from the pressure; and the response to the problem. Pressures affect the state of the environment, which in turn elicits responses to address those issues. Both pressure and state are typically required for evaluation. Indicators can be qualitative as well as quantitative with spatial as well as temporal dimensions.

18.2 Objectives of capacity building

The major objective of the present project is to develop environmental indicators expressed in terms of monetary terms and provide policy makers with an effective tool with which to make environmental and economic decisions. This will include the development of the (a) Cost of remediation index, (b) Environmental elasticity index, and (c) Environmental diamonds.

Cost of Remediation Index: This index measures environmental deterioration directly in economic terms. Four major environmental sectors are evaluated: air quality, water quality, land and ecosystem.

Environmental Elasticity: This index expresses the variability of environmental quality in relation to economic growth by measuring changes in environmental quality relative to changes in the economy it is possible to assess the sustainability of states, regions in the country and the country as a whole. This concept is particularly useful for monitoring environmental trends, which are essential for policy making at the macro level.

Environmental Diamonds: The diamond shows the relationship among the four principal dimensions of environmental quality: air, water, land and ecosystem. They are very good for visual comparison among sectors or among countries.

18.3 Programme

Development of Indicators: The study group will closely work with the local consultants with technical support and overall guidance from the expatriate consultant. The broad steps include

- identifying the critical areas for which indicators would need to be developed
- reviewing current information status (geographically and temporally) on environmental parameters, their method of measurement, time and frequency of measurement
- developing an appropriate and implementable set of indices to aid decision/policy makers

Implementation stage: This would require networking at two levels. The first would be at the field level - the field team for each of the areas would report/be linked with the appropriate regional offices, which in turn would be linked with the state head quarters.

18.4 Key institutions involved in planning, implementation and coordination

Planning

- Department of Forests & Environment, Govt. of Gujarat

Implementation

- Department of Forests & Environment, Govt. of Gujarat
- Gujarat Pollution Control Board
- Gujarat Ecology Commission

In coordination with

- Regional offices of Gujarat Pollution Control Board
- Municipal Corporations and Municipalities in Gujarat
- Gujarat Industrial Development Corporation
- Department of Health, Govt. of Gujarat

18.5 Additional staff to be appointed

None

18.6 Equipment to be procured

None

18.7 Number of persons to be trained

Two or three times (once in a year) the following set of personnel may be trained to implement environmental indicators at state level. About 20 persons will need to be trained from Department of Forests & Environment (Gujarat), Gujarat Pollution Control Board, Gujarat Ecology Commission, Decision makers (from Govt.)

18.8 Local consultants

18.9 Expatriate consultants

The suggested expatriate consultant organizations are Massachussets Institute of Technology (MIT), USA, Harvard University, USA and Dr John Dixon. World Bank.

(These consultants have also been suggested for development of Environmental Indicators at the national level - who can also help in accomplishing the task at State Level)

18.10 Draft terms of reference for the consultants

The terms of reference for the consultants will be

- Local environment: Identify environmentally sensitive areas in the country for which indicators will be developed
- For each sensitive area identified above, based on existing .... and actual surveys develop linkages between human activities, environment and natural resources, and wherever applicable with the response agents
- Formulate realistic and implementable pressure and state variables for the sensitive areas
- Help the Department of Forests and Environment. Govt. of Gujarat in interpretation and implementation of indications so as to maximize their efficiency in environmental protection/management.

Note: The above terms of reference are applicable to both local and expatriate consultants. The local consultant will be the lead agency while the expatriate agency will be the over-all advisor in implementing the above terms of reference.

18.11 Indicators of progress

- Availability of trained manpower for implementing environmental indicators
- Improvement in environmental assessment procedures in the state
- Environmental considerations in all major decisions at State level
- Improved consideration of environmental indicators at various levels in the state

18.12 Linkages with other sub-components

- Indicators developed specifically for Gujarat would help the Department of Environment (Chapter 15) and GPCB (Chapter 16) in their routine monitoring and forecasting activities.

18.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.60
Training	0.12
Materials & books	0.00
Equipment	0.00
Other costs	0.47
Total	1.18

Chapter 19

Coastal and marine area management

The Gujarat State Department of Environment (DoEG) intends to prepare an ICMAMP for its 1600 km (approximately) long coast (which is the longest coast comprising of 25% of the total Indian coast). In this, it is proposed to prepare status and problems associated with the coastal systems including corals, mangroves, various geomorphological features, marine systems including quantification of the species and their diversity, assessment of the coastal processes and their effects on the coastal and other activities including salinity ingress and coastal erosion, and preparing a management plan for monitoring and regulation of the coastal areas, various economic activities taking place there, and the various steps and measures to mitigate the adverse impacts of such activities and preservation of integrity of the coastal ecosystems.

Budget

Categories of expenditure	Amount (US $ million)
Consultant services	0.60
Training	0.10
Materials & books	0.03
Equipment	0.15
Other costs	0.06
Total	0.94

Chapter 20

Water Studies - Ahmedabad Municipal Corporation

20.1 Introduction

The Ahmedabad city is slowly becoming a victim of water shortages. The problems of water supply, sewerage and ground water exploitation put together have aggravated the city's infrastructural status over the past few decades. Realizing the need to revamp the problems of unplanned growth of infrastructure, an integrated study has been proposed to study the entire situation and prepare a master plan for the area details of which are given below.

20.2 Objectives of capacity building

The proposed study will critically investigate the major topics related to the Ahmedabad Municipal Corporation (AMC) infrastructural systems and prepare a master plan to cover the following subjects:

- Integrated development program for conjunctive utilization and conservation of water resources to supply needs until 2025
- Development of a water supply scheme including program for renovation and expansion of the treatment plant facilities
- Reduction of water losses in the city's distribution network
- Development of the city's sewerage and sanitation system as well as wastewater reclamation facilities
- Development of a storm water drainage system
- Institutional strengthening of AMC for handling various related issues

20.3 Programme

Since inauguration of its first water works in 1891, the city of Ahmedabad has witnessed impressive progress in the field of water resources development, water supply system expansion, sewerage, and storm water drainage. The needs of the rapidly increasing population have, however, pushed the existing resources to their limits; thus water from the Sabarmati River has been subjected to exhaustive withdrawal through systems of radial/infiltration wells, while groundwater from both the shallow phreatic aquifer and the lower confined aquifer has been exploited beyond their safe yield. In addition, the water resources are affected by intrusion of pollutants from poor sewerage and stormwater systems, causing environmental nuisances and affecting particularly the quality of water.

In order to increase the capacity of water supplied from the Sabarmati River, the Ahmedabad city authorities have invested large sums of money in the construction of Dharoi Dam, located about 150 km. upstream of the city. However, only part of the 680 MLD released from the dam reaches the new Kotapur water works-built recently to increase water supply to Ahmedabad-due to losses along the river.

The Ahmedabad Municipal Corporation (AMC) is now concerned with examining options to improve water supply to the city by rationalization of both water resources and the water supply system, the idea being to increase net water supply to the maximum extent possible until water is available from the Narmada project (envisaged to commence operation after the year 2000). Accordingly, the proposed study will critically investigate the major topics related to the AMC infrastructural systems and prepare a master plan to cover the following subjects:

- Integrated development program for conjunctive utilization and conservation of water resources to supply needs until 2025
- Development of a water supply scheme including program for renovation and expansion of the treatment plant facilities
- Reduction of water losses in the city's distribution network
- Development of the city's sewerage and sanitation system as well as wastewater reclamation facilities
- Development of a storm water drainage system
- Institutional strengthening of AMC for handling various related issues

The key to improving the present state of water resources and potable water supply systems in the Ahmedabad area lies in the application of the integrated approach, calling for effective exploitation of water resources on the one hand, and judicious management of the water supply system on the other. Based on extensive experience gained in the management of water resources, water supply systems, and wastewater reclamation, careful planning, management and control measures can be instituted to conserve water in the Greater Ahmedabad water supply system, thus increasing the net water available, making use of reclaimed water and maintaining high standards of quality for the environment.

The proposed master plan for water supply, sanitation, and drainage systems in the Greater Ahmedabad Area (GAA) calls for review of the long-term development programs for urban infrastructure and includes establishment of water demand and wastewater effluent forecast for the year 2025; analysis of the available and proposed water supply, sanitation and drainage facilities; and determination of available potential water resources earmarked for this purpose. The methodology of the proposed project include;

- Collection and review of available data, followed by preparation of a detailed program for the master plan
- Mapping, database and geographic information system (GIS) services
- Review of the socio-economic structure of the Greater Ahmedabad Area
- Preparation of population projections for the target year
- Estimation of water demand and sewage effluents for the target year
- Follow-up of parallel activities: water resources development program; water supply development scheme; central sewerage system and low cost sanitation facilities; storm water drainage system
- Institutional strengthening of AMC for handling various related issues
- Preparation of master plan

20.4 Key Institutions which will be involved in planning, implementation, and coordination

Ahmedabad Municipal Corporation. Ahmedabad.

20.5 Additional staff to be appointed

None

20.6 Equipment to be procured

Computers and GIS software (costs indicated in the budget)

20.7 Number of persons to be trained

None

20.8 Local Consultants

None

20.9 Expatriate Consultants

Tahal Consulting Engineers Ltd., Tel Aviv, Israel.

20.10 Draft Terms of Reference

The consultant will perform his services which include preparation of a master plan for Ahmedabad's infrastructure including development of:

- Water resources exploitation programs
- Water supply systems
- Sewerage and sanitation systems and wastewater reuse program

- Stormwater drainage system
- Institutional strengthening of AMC in the related areas

20.11 Indicators of Progress

- inventory of water supply/sewerage systems and problem areas
- comprehensive programs for water resources exploitation, water supply, sewerage and sanitation systems developed
- improved water supply and sewerage status
- availability of trained manpower for efficient management of problems related to water supply and sewerage

20.12 Linkages with other sub-components

None

20.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	1.36
Training	0.00
Materials & books	0.02
Equipment	0.08
Other costs	0.00
Total	1.46

Chapter 21

Municipal planning and training

21.1 Introduction

Environmental management in a state/district needs action at a settlement level. This has also been highlighted by the 74th amendment to the Constitution Act which mentioned that the municipal bodies will be also empowered with responsibilities of environmental management. However, the municipality officials would need some orientation and training to improve their knowledge and skills in this regard. Identifying these requirements, a capacity building program encompassing the municipal training and other requirements has been prepared for Gujarat State.

21.2 Objectives of capacity building

The following are the major objectives which are needed to be considered for capacity building in Gujarat State

- Developing guidelines for sustainable development planning based on case study of selected coastal and non-coastal cities in Gujarat
- Compilation of lessons from environmental economics for capacity building in municipal/local finance and financial management
- Training for the Urban/municipal environment at the State Govt. level, District, metropolitan and local levels.
- Development of urban environment database
- Study tours for key officials

Almost all these objectives are to be studied/executed in the present exercise in coordination with the Ministry of Urban Affairs and Employment at the centre.

21.3 Programme

- Undertake the tasks of developing basic information such as guidelines for sustainable development planning, lessons from environmental economics for financial management, etc.
- Initiate development of urban environmental database in selected cities and towns on priority basis based on their environmental significance

- Train the state officials including State Urban Development Department, District and local planning committees, Municipalities, and elected members at various levels

21.4 Key institutions involved in planning, implementation and coordination

Planning

- Urban Development and Urban Housing Department, Govt. of Gujarat
- Ministry of Urban Affairs and Employment, Govt. of India, New Delhi

Implementation

- Urban Development and Urban Housing Department, Govt. of Gujarat

In coordination with

- Town Planning & Valuation Department, Govt. of Gujarat
- Town & Country Planning Organization, New Delhi
- Gujarat Water Supply and Sewerage Board
- Gujarat Pollution Control Board

21.5 Additional manpower

None

21.6 Equipment to be procured

For database development computer hardware and software is required to be procured by the

- Urban Development and Urban Housing Department. Govt. of Gujarat
- All the six (6) Municipal Corporations
- Selected municipalities (one per district to start with ■ 19 districts)

Other equipment for selected municipalities includes

- Mirror stereoscope with parallax bar for stereo pair interpretation
- high magnification enlarger to enlarge aerial photographs or satellite imagery
- optical pantographs enlargement and reduction of transparencies on hard copies
- stereo zoom transferoscope to update old map using stereopair of photographs
- GIS software with digitizer and plotter facilities

(costs are indicated in the budget).

21.7 Number of persons to be trained

The training needs are essentially considered on the basis of training about 10% of the concerned staff who in turn will train the rest of the staff

■ At the State Govt. level	20
■ At the District level	50
■ Metropolitan and local level	
Govt. Officials	250
Non-officials (elected representatives)	250

21.8 Local consultants

For training the officials

- School of Planning, CEPT, Ahmedabad
- Others to be identified which may include contribution from
  - National Institute of Urban Affairs, New Delhi
  - Human Settlement Management Institute, New Delhi
  - National Institution of Occupational Health, Ahmedabad
  - Indian Toxicology Research Centre, Lucknow

For development of Urban environmental database

- National Institute of Urban Affairs, New Delhi
- Tata Energy Research Institute, New Delhi

21.9 Expatriate consultants

None

21.10 Draft terms of reference for the consultants

- *For environmental training of officials at various levels*

  The consultant(s) will train

  a) The officials at state, district and local level on the following aspects with working examples
    - Sustainable development planning

- Preparation and implementation of district and metropolitan development plans
- Environmental issues in planning at district, metropolitan and local level
- Land use planning and environmental considerations
- Air pollution monitoring
- Prevention of pollution of potable water supply
- Wastewater treatment/recycling
- industrial effluent management
- Noise pollution and its control
- Solid waste management and safe disposal practices
- Hospital waste management and disposal
- Storm drainage (Indian condition) management/treatment/recycling
- Public health, preventive health. disaster/epidemic management, etc.

b) The elected representatives of municipalities in the following aspects
  - Environmental problems of municipalities (air, water and noise pollution, solid waste disposal. etc)
  - Sustainable development planning
  - Need for financial allocation for environmental components
  - Preparation and implementation of district and metropolitan development plans
  - Environmental issues in planning at district, metropolitan and local level
  - Land use planning and environmental considerations
  - Public health. preventive health. disaster/epidemic management, etc.

- *For documentation/database studies*

The consultant(s) will

- develop guidelines for sustainable development planning based on case study of selected coastal and non-coastal cities in Gujarat in coordination with the concerned departments at the State Govt. and Central Govt.
- compile lessons on environmental economics for capacity building in municipal/local finance and financial management

21.11 Indicators of progress

- Successful training of municipal staff in the respective municipalities by the officials who were trained under this program
- Preparation of development plans at district and municipality/metropolitan level
- Incorporation of guidelines developed for environmental economics and sustainable planning in the development plans
- Improvements in day to day functions of municipal staff with the availability of urban environmental database
- Improved municipal premises in terms of cleanliness, air quality, water quality, etc.

21.12 Linkages with other sub-components

- Activities in this sub-component could be linked to those under State Environment Action Plan (Chapter 14), and Environmental Indicators (Chapter 18).

21.13 Budget

Categories of expenditure	Amount (US $ million)
Consultant services	1.80
Training	1.08
Materials & books	0.00
Equipment	0.30
Other costs	0.00
Total	3.18

Summary of sub-component linkages

The sub-components mentioned in each group are potentially linked (in the sense that the outputs of one could serve as inputs for another and *vice versa*) to the sub-component indicated by the title of the group.

1 Environmental Research
  - Environmental Information
  - Environmental Standards

2 Environmental Information
  - Community and NGO Initiatives
  - Ambient Air Quality Monitoring
  - Environmental Economics
  - Environmental Indicators

3 Environmental Economics
  - Environmental Indicators

4 Environmental Law
  - Environmental Standards
  - Strengthening Regional Offices of MoEF
  - Mining Sector
  - Community and NGO initiatives
  - Coastal and Marine Areas Management

5 Environmental Standards
  - Mining Sector
  - Marine and Coastal Areas Management

6 Environmental Indicators
  - Strengthening Regional Offices of MoEF
  - Ambient Air Quality Monitoring
  - Mining Sector
  - Municipal Planning and Training
  - Coastal and Marine Areas Management

7 Strengthening Regional Offices of MoEF
  - Mining Sector
  - Industry Siting

8 Industry Siting
  - Ambient Air Quality Monitoring
  - Municipal Planning and Training
  - Coastal and Marine Areas Management

9 Gujarat State Environment Action Plan
  - Environmental Indicators, Gujarat

Annexure 1. Minerals specified in the First Schedule

Specified minerals

Part A. Hydro carbons, Energy minerals

1 Coal and lignite

Part B. Atomic minerals

1 Beryl and other beryllium-bearing minerals.
2 Luthium-bearing minerals.
3 Minerals of the rare earths group containing Uranium and Thorium.
4 Niobium-bearing minerals.
5 Phosphorites and other phosphatic ores containing Uranium.
6 Pitchblende and other Uranium ores.
7 Rutile.
8 Tantallium-bearing minerals.
9 Uraniferous allanite, monazite and other thorium minerals.
10 Uranium-bearing tailings left over from ores after extraction of copper and gold, ilmenite and other titanium ores.
11 Zircon.

Part C. Metallic and non-metallic minerals

1 Asbestos.
2 Bauxite.
3 Chrome ore.
4 Copper ore.
5 Gold.
6 Iron ore.
7 Lead.
8 Limestone, except when it is used in kilns for the manufacture of lime as building material.
9 Manganese ore.
10 Precious stones.
11 Zinc.

Annexure 2 Profile of Centre of Mining Environment, Dhanbad

Introduction

The Centre of Mining Environment at the Indian School of Mines, Dhanbad was established by the Ministry of Environment and Forests, Government of India as a Centre of Excellence in 1987. The Centre is under administrative control of the Indian School of Mines and its research and developmental activities are wholly supported by the MoEF. In its life span of about nine years, the Centre has developed its capabilities and established laboratories for research and development in 'Mining Environment'. A brief profile of the Centre is given hereunder.

Objectives

- To impart training to in-service field personnel in environmental science and technology with particular reference to environmental management in mining areas.
- To carry out research in the field of mining environment.
- Initiation of regular academic programmes leading to M.Tech. degree in environmental science and engineering.
- To undertake consultancy and testing work to help mining and mineral industries in the neighbouring areas in solving environment pollution problems.

Expertise available

- Environmental management in mining areas
- Air and water pollution and its control
- Subsidence prediction, control and management
- Land-use management
- Land reclamation
- Wastewater treatment
- Soil conservation
- Noise and vibration
- Management of spoils and tailings

Laboratories

- Computer systems
- Ecology
- Soil sciences
- Air pollution
- Water pollution
- Land-use and hydrology

Major equipment

- Hardware and software for GIS application to environmental studies
- Gas chromatograph
- UV-VIS record spectrophotometer
- Atomic absorption spectrophotometer with graphite furnace, hydride generator and data station
- High volume samplers
- Real time aerosol monitor
- Selective ion electrode analyse
- Bacteriological incubator
- Programmable noise level meter
- Vibration monitoring kit
- Monitoring van with equipment
- Ram-1
- Meteorological instruments
- Laminar flow chamber
- Optical pantagraph

Activities

Ongoing research and development

- Carrying capacity of Damodar River Basin (MoEF).
- Studies on green belt regarding its noise attenuation and dust arresting capacity in coal mining areas.
- Weather data generation.
- Noise studies in Dhanbad District.
- Air pollution in Dhanbad Town.
- Well water quality in Dhanbad Town.
- Utilization of mining area degraded land (Laboratory experiments).
- Coal combustion residue utilization (Preliminary studies).
- Land use changes in mining areas.
- Heavy metal pollution in water bodies of Jharia Coalfield (Preliminary assessment).
- Noise situation in mining complexes (Moonidih and PPCL Amjhore).
- Land subsidence due to fluid withdrawal.
- Changes in vegetation index and soil moisture in India.

Proposed research and development

- Continuation of present R&D activities.
- Taking-up the following nine R&D projects:
  - Socio-economic evaluation of coal mining complexes with a view to affecting societal development and developing mineral area societal development index.
  - Investigations into the ground water balance in Jharia Coalfield.
  - Development of noise indices for coal mining complexes.
  - Time-scale land-use studies of mining districts of Chotanagpur and Santhal Pargana region in Bihar.
  - Air quality impact assessment development of pollutant dispersion models for mining areas.
  - Survey, isolation and inoculation of Ectomycorrhizal and Vasicular-Arbuscular Mycorrhizal fungi in coal mine overburden dumps.
  - Investigations into geotechnical and environmental parameters for design of compliant tailings impoundments.
  - Environmental pollution potential of the acid waste-rock and tailings in Indian base metal mines and its abatement.
  - Environmental assessment of coal combustion residues from thermal power stations.
- Status report on various environmental subjects.
- Data-bank on environmental parameters.

Human resource development

- The Centre has been organizing One-week to Thirteen-week duration executive development programmes for executives of mineral industry (both off-campus and in-campus).
- Total number of courses conducted so far is 23.
- Development of modular programmes of one-week, two-week and six-week duration to be offered on regular basis on the following subjects:
  - Environmental management (six-week)
  - EIA practices (two-week)
  - Water management (two-week)
  - Land management (one-week)
  - Air and noise pollution and its management (two-week)
  - Noise and human response (one-week)

Ongoing academic activities

- M.Tech. (Environmental Science and Engineering programme)
  Intake - 10 GATE qualified, 5 sponsored.
- Teaching environmental subjects in
  - B.Tech. (Mining Engineering)
  - M.Tech. (Mineral Exploration)
  - M.Tech (Industrial Engineering and Management)

Proposed academic activities

- Continuation of the M.Tech. (Environmental Science and Engineering) programme
- A fresh market survey for environmentally trained persons for assessing possibilities of starting B.Tech. (Environmental Engineering) programme.
- One-year Post-Graduate Diploma in Environmental Management for sponsored candidates only.

Annexure 3 List of equipments/ instruments needed in the selected institutions

1 For IBM, Nagpur

A.	**Air quality monitoring**
1	Atomic absorption spectrophotometer
2	Electronic balance (4 digit)
3	Real time aerosol monitor with data logger
4	Wind monitor with data logger
5	Hot plate
6	Laser based master particle size analyzer
7	Double distill water system (glass) (ion exchange unit)
8	Spectrophotometer
9	High volume sampler (8 nos.)
10	RPM-10 sampler (5 nos.)
11	CO monitor (2 nos.)
12	Weather monitor (1 no.)
13	Gas chromatograph
14	Gravimetric dust sampler (2 nos.)
15	Personal dust sampler (6 nos.)
B.	**Water quality monitoring**
1	BOD incubator
2	pH meter
3	Water analysis kit
4	Nephelometer
5	Water flowmeter
6	Flame photometer
7	Conductivity meter
8	Kjendhal unit
9	COD digestion unity with vertical condensers
10	Hot plate (already given in air)
11	Suction pump (GF/C) and BOD aerator

C.	**Soil quality monitoring**
1	Flame photometer
2	Oven
3	Soil sampling tube
4	Soil moisture tester
5	Shaker machine for soil texture analysis
D.	**Noise monitoring**
1	Noise level meter and frequency analyses (2 nos)
2	Audio meter
E.	**General**
1	Computer
2	Internet
3	GIS

2 CME, Dhanbad

- Gas chromotographs
- Continuous monitoring system for SO_2, NO_x, hydrocarbons. CO and CO_2 in atmosphere
- Microbiology laboratory set-up

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11. Municipal Planning and Training	■ Dr P Mohanty, Joint Secretary, Ministry of Urban Affairs and Employment, New Delhi
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21. Municipal Planning and Training	■ Mr P K Ghosh, Additional Chief Secretary, Urban Development and Urban Housing Department, Gujarat, Gandhinagar

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Abbreviations

AMC	Ahmedabad Municipal Corporation
BOD	Biochemical Oxygen Demand
CEE	Centre for Environment Education
CHIS	Critical Habitat Information System
CME	Centre for Mining Environment
CMRI	Central Mining Research Institute
COD	Chemical Oxygen Demand
COMAPS	Coastal Ocean Monitoring and Prediction System
CPCB	Central Pollution Control Board
CZIS	Coastal Zone Information System
DEA	Department of External Affairs
DGMS	Directorate General Mine Safety
EAP	Environment Action Plan
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
ENVIS	Environmental Information Systems
ERP	Environment Research Programme
FP	Focal Point
GEC	Gujarat Ecology Commission
GIS	Geographical Information System
GOI	Government of India
GPCB	Gujarat Pollution Control Board
IBM	Indian Bureau of Mines
ICMAMP	Integrated Coastal and Marine Areas Management Plan
IDRC	International Development Research Programme
ITRC	Indian Toxicological Research Centre
JNU	Jawaharlal Nehru University
MoEF	Ministry of Environment and Forests
MoUAE	Ministry of Urban Affairs and Employment
NCB	National Coal Board
NEAC	National Environmental Awareness Campaign
NEERI	National Environmental Engineering Research Institute
NIC	National Informatics Centre
NIO	National Institute of Oceanography

NIOH	National Institute of Occupational Health
NLSIU	National Law School of India University
NRSA	National Remote Sensing Agency
PCB	Pollution Control Board
PM	Particulate Matter
PSR	Pressure-State-Response
PV	Paryavaran Vahini
RMOEF	Regional Ministry of Environment and Forests
RRA	Regional Resource Agency
RSC	Regional Service Centre
SDNP	Sustainable Development Network Programme
SEAP	State Environment Action Plan
SPCB	State Pollution Control Board
TCPO	Town and Country Planning Organization
UD	Urban Development
UGC	University Grants Commission
UNDP	United Nation Development Programme
UNEP	United Nation Environment Programme
USBSM	United State Bureau of Surface Mines
USEPA	United State Environmental Protection Agency
WLA	Waste Load Assimilation